فحص
جودة البناء

Construction Quality Training & Inspection Program

Inspection Book

VERSION 03 – May 2021

Content

1.0 Introduction

This technical book was written in cooperation with the program of Sustainable Building and focus on the Construction Quality Inspection. First, the definion of a third-party inspector will be defined. After that, the main tasks and responsibilities of an inspector will be mentioned. Then the inspection book will give an overview of the purpose and the modelling of the inspections.

The Inspection Book for Construction Quality Training & Inspection deals with two building models. These are on the one hand the Individual Model (detached house / individual dwelling unit) and on the other hand the Developer Model (multi housing project). First, each model is briefly explained and described. Subsequently, the executed technical crafts are presented for each construction model and explain the difference in the execution of these crafts between the two models. Then the most important points for creating a documentation are summarized.

Finally, the individual technical crafts are explained by means of a table. This table contains five columns. Each individual column of this table can be described as follows:

1. Technical Craft: Subsection of technical examination

2. Applied Standards: Here is the source for the technical stipulations mentioned, besides the Saudi Buidling Code SBC. Other sources than SBC shall provide additional information, where as only the SBC is mandatory for the inspections.

3. Technical Function / Quality: This column states the applicable quality standard level or provides additional technical background information

4. Inspection Scope: This column stipulates the mandatory inspections and provides requirements, tolerances and quality levels where applicable.

5. Findings, Defects: This column provides photos and comments with examples of deficiencies

Additionally, there are checklists attached for inspector’s task orientation during the inspection work.

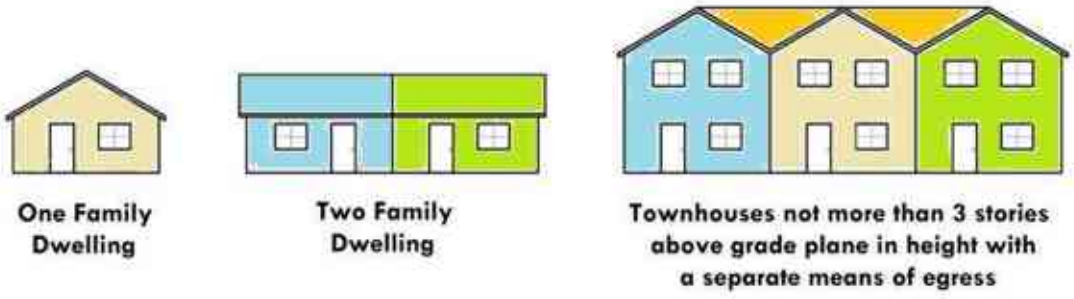
2.0 Scope

The scope of the inspection program is the inspection of:

1) Villas (detached one family dwelling).
2) Duplexes (detached two family dwelling)
3) Townhouses: adjacent dwellings that are connected from two sides.

which meet the following:

1) Maximum number of stories above ground plane: three stories.
2) Maximum number of stories below ground plane: one story.
3) Every dwelling has a separate means of egress.



Townhouse **must** meet **all** four criteria:

1) It is not more than three stories in height.
2) It has a separate means of egress.
3) Each unit extends from foundation to roof.
4) There is open space on at least **two** sides.

The applicable code:

The requirements of the inspection book are based on the Saudi Building **Residential** Code **SBC 1101, and SBC 1102** and Mostadam's quality requirements**.**

3.0 The regulation for classification of the Saudi Building Code violations

Any violation of the requirements, system or regulations of the Code is an offense that requires removal or correction, and the violator shall be subject to the penalty decided by the Consideration Committee upon the fulfillment of its statutory requirements. The penalty shall not be considered as an alternative to the removal or correction.

Code violations are classified into hazardous and non-hazardous violation. When a violation is discovered during the inspection or supervision process and the violator does not promptly correct it, or if a notice is received thereof, the **control officer** shall be notified thereof to consider.

Regulation for Classification of the Saudi Building Code Violations

The **control process** shall be carried out in accordance with a unified form prepared by the competent authority in the Ministry of Municipal Rural Affairs & Housing. It shall include the following:

a) The date, day and hour of control.
b) Name of the building owner.
c) License number and type.
d) Classification, type and location of the building.
e) The type, description and location of the violation in the building.
f) Reference and number of the violation in the code.
g) The extent of hazard of the violation and the resulting damage.
h) Estimation of the period required for correction or removal of the violation.

i) Name of the violator, his acknowledgement and signature, and a reference to his abstention, if any.
j) Documenting the violations with pictures or, if possible, attaching them.
k) Name and signature of the control officer.
l) Any other information which the relevant authority of the Ministry deems fit to add.

Non-hazardous violation:

1) When a non-hazardous violation is discovered, the relevant body shall duly notify the violator with the same and request him to remove or correct it in accordance with the code within the period specified in the control minutes.
2) If the violation is removed or corrected, the violator will notify the relevant body with the same.
3) If the violator failed to remove or correct the violation within the specified period, the relevant body shall refer the violation to **the Committee for the consideration of the violations.**

Hazardous violation:

Upon discovering a hazardous violation, the relevant body shall:

1) Notify the violator through the due reporting methods and request him to remove or correct them immediately according to the code.
2) Suspend the construction, section or part that constitutes a danger or prevent the occupancy or operation or evacuation of the building until the violator removes or corrects the violation.
3) Refer the violation to the Committee for consideration of violations within five working days from the date of discovery.

Removal of hazardous violation:

A. If the violator does not initiate the removal of the hazardous violation or within the time limit for the other violations, and the violation directly impairs or disrupts the use of roads or public utilities, poses a danger to safety, public health, or the environment, or deforms the or deforms the general appearance of the city, the municipal body upon coordination with the relative authorities, may remove the violation at the expense of the violator.
B. If a serious violation is discovered and the violator or his address is not identified, the control officer shall prepare a report on the violation. Investigation and search shall be conducted about the violator. If he cannot be reached, the Municipal Body shall, after coordination with the competent authorities, evacuate the building, prevent occupancy or remove the violation if necessary. Upon identifying the violator, he shall bear the expenses of the removal in addition to the penalty incurred thereon.
C. If the removal of violation is detrimental to the safety of the building, it shall be corrected in order to achieve safety according to the possible engineering solutions, provided that a report is obtained from a certified and qualified engineering office by the Ministry that proves the safety of the building and the impossibility of removal.

The Committee for the consideration of the violations:

Without prejudice to any heavier penalty provided for in another regulation, the Consideration Committee shall consider imposing appropriate penalties for any violation in accordance with the Law, and shall take into consideration the following principles:

1. The extent of danger of the violation and its impact on the damage to life, money, health or public order.
2. The area of the building, its size, type, cost of construction, and the importance of its location.
3. The penalty's suitability with the violation.
4. The mitigating and aggravating circumstances associated with the commission of the violation.
5. The violator's initiative to remove or correct the violation.
6. Frequency of the violation.

7. If the violation is accompanied by trying to obstruct the process of control, inspection or lack of cooperation with officials.
8. Deliberately committing the violation.

Decisions of the Consideration Committee shall be effective upon issuance, and the violator shall be notified by the methods of notification adopted.
The decisions of the consideration committees may be appealed before the administrative courts at the Board of Grievances within sixty days from the date of knowledge thereof.
If any penalty is imposed on the consulting, engineering, technical offices or contractors because of violation of the code, the municipal authority shall notify the reference authorities with the violations and penalties imposed on them. general appearance of the city, the municipal body upon coordination with the relative authorities, may remove the violation at the expense of the violator

Schedule of Violations and Penalties:
The Consideration Committee shall apply the penalties stipulated in the Schedule of Violations and Penalties. The class of violations of the Saudi Building Residential Code (SBC 1101, and SBC 1102) is **"Class 1"**.

#	Violation	Class 1		Class 2		Class 3		Class 4		Class 5	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1	Submitting any drawings, designs, reports or technical accounts that are contrary to the code license is issued under it	5	30	30	60	60	120	120	240	240	480
2	Approved drawings, designs, accounts or reports that are contrary to the code by the private auditors.	40	800	80	160	120	240	160	320	200	400
3	Carry out Construction, demolition, restoration or maintenance work without issuing a license or after its expiry.	5	30	30	60	60	120	120	240	240	480
4	Carry out works contrary to the license, drawings, accounts or technical reports approved according to the code.	5	30	30	60	60	120	120	240	240	480
5	Failure to comply with the safety precautions contained in the code during construction, demolition or repair work	5	30	30	60	60	120	120	240	240	480
6	Continue construction, demolition, repair or maintenance after the suspension	40	80	80	160	120	240	160	320	200	400
7	Lack of a certified copy of the building license and approved drawings at the work site.	2	5	4	10	8	15	14	30	20	50
8	Occupancy of the building or changing its use without a certificate of occupancy.	10	50	40	100	80	200	160	400	300	1000
9	Continuing to occupy the building after being prohibited or occupying the temporary building after the expiry of the certificate.	10	50	40	100	80	200	160	400	300	1000
10	Launching public utilities (electricity, water, sewage,	5	10	10	30	20	60	40	120	80	240

21	Failure to submit a soil testing study to the site	1	5	5	20	30	60	45	100	80	150
22	Violating the design and implementation of the building resistance to earthquakes and wind load requirements according to the code.	5	30	30	60	60	120	120	240	240	480
23	Violation of technical requirements for the design and implementation of thermal insulation of the building.	20	80	80	100	120	240	180	320	200	400
24	Failure to comply with the terms and requirements of the work of insulation and protection of the building or facility from leaks of rain and surface water according to the code.	5	30	30	60	60	120	120	240	240	480
25	Non-compliance with the terms and requirements of rationalization of water and electricity according to the code.	5	30	30	60	60	120	120	240	240	480
26	Violation of the technical requirements for the design and implementation of [illegible] recycling systems for hotels, student housing, powered central markets, educational buildings (E), industrial buildings (F), and health and social care buildings (I).	-	-	-	-	40	100	80	200	120	300
27	Violating the requirements for the installation and extension of sanitary systems and drainage systems according to the code.	5	30	30	60	60	120	120	240	240	480
28	Violation of the terms and requirements for the design and implementation of mechanical works, HVAC systems, stoves, heating and gas extensions in the	5	30	30	60	60	120	120	240	240	480

Note:

Class 1	Class 2	Class 3	Class 4	Class 5
R-3, R-4	S-2, R-1	B, F-2, R-2, I-4, S-1	A, E, I-1,2,3, M, F-1	U, H

Whrere: A=assembly group; B= Business group; E= Educational group; F= Factory Industrial group; H= High-hazard group; I= Institutional group; M= Mercantile group; R= Residential group; S= Storage group; U = Utility and Miscellaneous group. (For more information refer to SBC 201; Chapter (03)).

The Saudi Building Code General SBC-201

The Saudi Building Code General Requirements (SBC 201) provides minimum requirements for the public safety, health, and general welfare of the occupants of new and existing buildings and structures.

The code primarily addresses structural strength, means of egress, sanitation, adequate lighting and ventilation, accessibility, energy conservation and life safety in regard to new and existing buildings, facilities and systems. The Code also prescribes minimum structural loading requirements for use in the design and construction of buildings and structural components.

The Saudi Loading Code SBC-301

Saudi Building Code SBC 301 provides minimum load requirements for the design of buildings and other structures.

SBC 301 describes the means for determining design loads including: dead, live, soil, flood, rain, earthquake, and wind as well as how to assess load combinations.

The Saudi Construction Code SBC-302

The Saudi Building Code for Construction (SBC 302) provides the requirements for the design and safety of formwork, construction requirements for structural concrete, and requirements for agencies engaged in inspection and testing of materials.

The Saudi Building Code for Soils and Foundations SBC-303

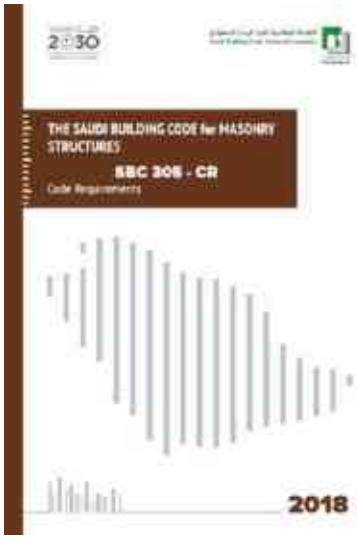
The Saudi Building Code for Soils and Foundations referred to as SBC 303 provides minimum requirements pertaining to material properties of soils, and design and construction of foundation systems.

SBC 303 covers: geotechnical investigations; excavation grading and fill; presumptive load-bearing of soils; spread footings; foundation walls; retaining walls; combined footings and mats; design for expansive soils; design for collapsible soils; design for sabkha soils; design for vibratory loads; damp-proofing and waterproofing; and deep foundations.

The Building Code for Concrete Structures SBC-304

The Building Code requirements for Concrete Structures (SBC 304) provides minimum requirements for the materials, design and detailing of concrete buildings for ensuring public safety and health.

The SBC 304 addresses structural systems, members, and connections, including cast-in-place, precast, plain, non-prestressed, prestressed, and composite construction.



The Saudi Building Code for Masonry Structures SBC-305

The Saudi Building Code for Masonry Structures (SBC 305) provides minimum requirements for the structural design and construction of masonry elements consisting of masonry units bedded in mortar.

SBC 305 and addresses the structural design of both structural and non-structural masonry elements. The nonstructural elements are primarily masonry veneer, glass unit masonry, and masonry partitions.

The Saudi Building Code for Steel Structures SBC-306

The Saudi Building Code for Steel Structures (SBC 306) provides minimum requirements for the structural design and construction of structural steel system or systems with structural steel acting compositely with reinforced concrete.

The Saudi Electrical Code SBC-401

The Electrical Requirements provide a common set of regulations for applications to the electrical installations in buildings in the Kingdom of Saudi Arabia. Up to the date of issuing this edition, a variety of standards and/or requirements are applied in the design and installation of electrical installation works.

The Saudi Mechanical Code SBC-501

The Saudi Mechanical Code (SBC 501) is a Code that regulates the design and installation of mechanical systems, appliances, appliance venting, duct and ventilation systems, combustion air provisions, hydronic systems and solar systems. SBC 501 provides minimum requirements to establish the minimum acceptable level of safety and to protect life and property from the potential dangers associated with the installation and operation of mechanical systems. The Code also provides the minimum requirements to protect the personnel that installs, maintain, service and replaces the systems and appliances addressed by this Code.

The Saudi Energy Conservation Code Except Residential SBC-601

The Saudi Energy Conservation Code (SBC 601) provides minimum energy efficiency requirements for all types of buildings, with the exception of low-rise residential buildings, in Saudi Arabia. SBC 601 addresses energy conservation requirements for all aspects of energy used in residential construction, including heating and ventilating, lighting, water heating, and power usage for appliances and building systems. SBC 602 sets forth minimum requirements for exterior envelope insulation, window and door U-factors and SHGC ratings, duct insulation, lighting and power efficiency, and water distribution insulation.

The Saudi Energy Conservation Code for Residential Buildings SBC-602

The Saudi Energy Conservation Code (SBC 602) provides minmum energy efficiency requirements for low- rise residential buildings in Saudi Arabia. SBC 602 addresses energy conservation requirements for all aspects of energy used in residential construction, including heating and ventilating, lighting, water heating, and power usage for appliances and building systems. SBC 602 sets forth minimum requirements for exterior envelope insulation, window and door U-factors and SHGC ratings, duct insulation, lighting and power efficiency, and water distribution insulation.

The Saudi Building Plumbing SBC-701

The Saudi Building Plumbing (SBC 701) is a Code that regulates the design and installation of plumbing systems including the plumbing fixtures in the buildings. SBC 701 addresses general plumbing regulations, fixture requirements, water heater installations and systems for water distribution, sanitary drainage, special wastes, venting, storm drainage and medical gases. The purpose of the SBC 701 is to the establish the minimum acceptable level of safety to protect life and property from the potential dangers associated with supplying potable water to plumbing fixtures and outlets and the conveyance of bacteria-laden wastewater from fixtures.

Saudi Private Sewage Disposal Code SBC-702

Saudi Private Sewage Disposal Code (SBC 702) provides minimum requirements for the installation of new or the alteration of existing private sewage disposal systems. Where a building cannot be served by a public sewer system, the building site must be provided with a system for treating the wastewater generated from the use of plumbing fixtures in the building.

SBC 702 addresses site evaluations, materials, various soil absorption systems, holding tanks, cesspools and on-site wastewater treatment systems.

The Saudi Fire Code SBC-801

The Saudi Fire code (SBC 801) provides minimum fire prevention, fire protection, life safety and safe storage and use of hazardous materials in new and existing buildings, facilities and processes.

SBC 801 regulates the various hazards that may be housed within the building, including refrigeration systems, application of flammable finishes, fueling of motor vehicles, high-piled combustible storage and the storage and use of hazardous materials.

SBC 801 sets minimum requirements for maintaining the life safety of building occupants, the protection of emergency responders, and to limit the damage to a building and its contents as the result of a fire, explosion or unauthorized hazardous material discharge.

The Saudi Existing Building Code SBC-901

The Saudi Existing Building Code (SBC 901) provides alternative approaches to repair, alteration and additions to existing buildings.

SBC 901 provides three main options for a designer in dealing with alterations of existing buildings.

- **OPTION 1**: in accordance with the Prescriptive Compliance Method given in Chapter 4.
- **OPTION 2**: in accordance with the Work Area Compliance Method given in Chapters 5 through 13.
- **OPTION 3**: in accordance with the Performance Compliance Method given in Chapter 14.

The Saudi Building Code for

Green Construction SBC-1001

SBC 1001 is intended to safeguard the environment, public health, safety, and general welfare through the establishment of requirements to reduce the negative impacts and increase the positive impacts of the built environment on the natural environment and building occupants.

However, this code is an overlay document to be used in conjunction with the other Saudi codes. This code is not intended to be used as a standalone construction regulation document and permits are not to be issued under this code.

The Saudi Building Residential Codes

SBC 1101 & SBC 1102

The Saudi Building Residential Code shall apply to the construction, alteration, relocation, enlargement, replacement, repair, equipment, use and occupancy, location, maintenance, removal, and demolition of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane height with a separate means of egress, and their accessory structures not more than three stories above grade plane in height.

4.0 Task and responsibilities of an 3rd party Building quality inspector

The inspector as an 3rd party:

The inspector is fully independent and impartial and shall not have no financial interest in projects for which they provide inspection.

The inspector decides only according to:

- Saudi Building code,
- construction license,
- approved standard specifications,
- the schedule of code violations and penalties,
- approved plans and drawings,

- third party test reports,
- the statement of special inspections prepared by RDP (Registered Design Professional),
- Mostadam's quality requirements,
- manufacturer's instructions and
- contracts given.

The inspector moderates neutrally between contractor and permittee **(**owner/ the owner's authorized agent) in case of conflicts. No owner wishes or contractor meanings will be considered in the result of the inspection.
The inspector has no obligation to sign any documents on the construction site but has the full responsibility for transparent and correct defect assessment.
It is not the responsibility of the inspector to decide or provide solutions to address or repair defects or nonconforming items.

Duties and Responsibilities of the Inspector:
The inspector is looking at the overall status of the building and beyond the hold-point inspection checklist to identify other potential defects that might be not visible at a later state anymore.
The inspector documents the status and the identified defects and code violation with pictures and written statements regarding the deviations.
The inspector carries out his work without delay and submit the inspection report on the same day or the next day to be recorded, reviewed, and approved.
If there are questions, the inspector should contact the RDP who developed the statement of special inspections. The inspector should not wait until he is on site to ask questions and he should be aware of the answers to the questions because bids based on false assumptions can leave the inspector responsible for unanticipated costs.
The inspector prepares the inspections according to the triple five (5+5+5) steps of inspection:

1) Before arriving on the job site.
2) At the job site: during inspection.
3) After completing the inspection.

Before arriving on the job site:

1) Accepting of the inspection request from Mostadam's platform.
2) Double check the building status regarding to the hold-point number**.**
3) Prepare checklists and review available documents (materials, approved building documents**,** plans and specifications, contracts, construction license, latest report and the statement of special inspections and clarify any questions).
4) Read the hold-point crafts details in the inspection book to be inspected and review the Saudi Building Residential Code SBC 1101, and SBC 1102 if needed.
5) Take potentially needed technical inspection instruments (meter, fully charged camera, stick etc.)

At the Job Site:
When arriving at the job site, before signing in check that all required personal protection equipment (PPE) is on and all materials needed for the first set of inspections and/or testing are ready.

1) Check in with the contractor/designate and introduce the working procedure to him in order to participate within the inspection if needed.
2) Have an overall view of the building and craft status including latest hold-point report to identify other potential defects that might be not visible at a later state anymore**.**
3) Start inspection according to the prepared checklist.

4) Compare as build status with the construction license/contract/Code/ approved plans and specifications/inspection book/ manufacturer's instructions, if needed.
5) Take sufficient number of pictures of all defects and nonconforming items.

After completing the inspection:

1) Write the inspection report immediately to bring all defects and nonconforming items to the immediate attention of the contractor and copied the owner.
2) If any nonconforming item is not resolved in a timely manner or is soon to be covered up without resolution, the RDP and the building official should be notified immediately, and the item noted in the inspector's written report.
3) The inspector should include in the report, any resolution or corrective action taken by the contractor.
4) Notify the building official with any violation of the requirements, system or regulations of the Code that was not removed or corrected.
5) Upon discovering a hazardous violation, notify the violator and reject the hold-point.

5.0 Purpose and modeling

Inspections on site by the right time will enable the house-builder precisely the principal to conduct a building quality concept. This is of imminent need and basis to acknowledge defects on site. The inspections as a quality check are part of an ongoing building quality progam to improve the building quality significantly.

The objective of the inspections, beside the general execution quality, should be to check the execution of the construction work so that any defects that exist are detected during the construction period. During the respective inspections it is also necessary to check whether the chosen type of technical implementation could cause a defect.

During the inspection defects influencing the building quality will be identified and assessed and are categorized according to the following scheme:

Grading	Definition	Example	Reporting to	Remedial dealine
1	**Minor defect**	Deficiencies with no quality or saftey influence but inconsistence with the contract. Action according moderation between owener/contractor. E.g. circuit breaker at wrong position	Owner/Principle + Construction company	6 months
2	**Defect**	All deficiencies that can be corrected until the next inspection-mediate action. E.g. holes in masonry with no structural relevance, or wallcracks without static defect	Owner/Principle+ Construction company	Next inspection
3	**Major defect**	Project stop potential if further construction process is affected, or danger causes immediate action. E.g. formwork for foundation without concrete coverage for steel bars	Owner/Principle+ Construction company + Holdpoint rejection	Immediate action: Potential/ partial project stop

Individual model – detached house (Individual dwelling unit)

Introduction

Basic conditions are as follows:
- The inspector has received the approved drawings and planning documents.
- The inspector has received the reinforcement plans.
- The inspection scope applies for one single building/unit.
- The reinforcement work (reinforced concrete) must be approved by a structural engineer.

8 inspections (incl. handover) should be carried out during the construction of a detached house (individual dwelling unit).

The objective of the respective inspections, among other things, should be to check the execution of the construction work so that any defects that exist are detected during the construction period. During the inspections, it is also necessary to check whether the chosen type of execution could cause a defect.

The construction of a detached house usually takes approximately 12 months. However, the inspections should only be carried out in 8 steps during the complete construction period.

As many elements of work or construction parts as possible should be examined on these 8 steps. The 8 steps contain the following main technical crafts that are assigned to seven “Holdpoints”:

Some examples of holdpoint coordination and timing as well as inspection processing are given below:

- Structural elements with finished surfaces, for example, plastered walls, tiled walls, door leaves, can be examined during the handover. This is not possible in the case of structural elements, which are concealed by another trade, for example, the waterproofing in the area of the roof terrace.

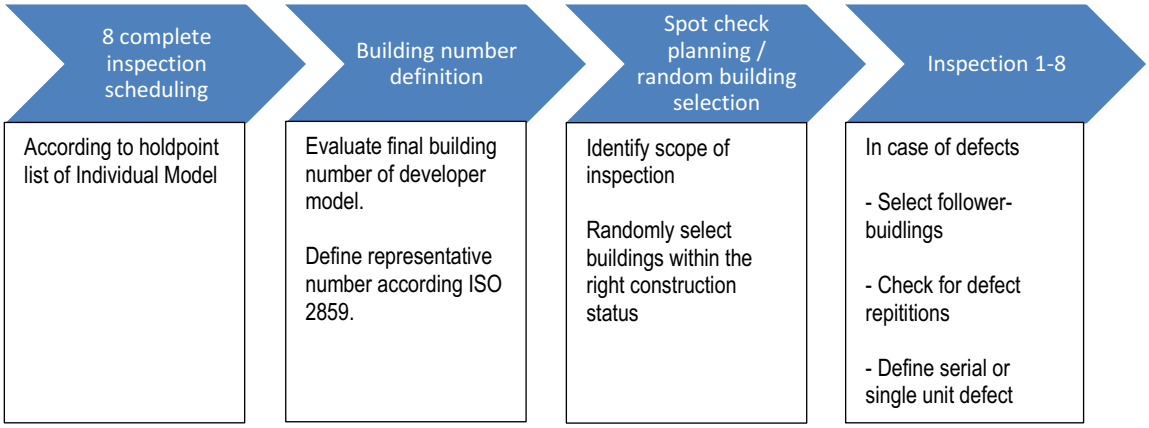
- The function of the waterproofing, i.e. that protects the building from water penetration, is to be considered technically higher or more important than the visual function of the tile laid on top of the waterproofing. Consequently, it would not make any sense to examine the waterproofing if the screed and flooring have already been laid on the waterproofing. This example is given to illustrate that the inspection dates should be coordinated so that as many trades / structural members or elements that are still visible and have not yet been concealed can be examined on one inspection date.

- The home owner is responsible to call for the respective holdpoint inspections. For this pupose all information about the construction schedule and the scheduled dates and deadlines on the construction site need to be communicated between the involved parties (owner, contractor, inspectors). The inspection dates can be roughly planned on the basis of a time schedule; however, the precise inspection dates can only be decided in close consultation with the site engineers or contract manager.

Developer model – multiple occupancy buildings, large construction site

Introduction

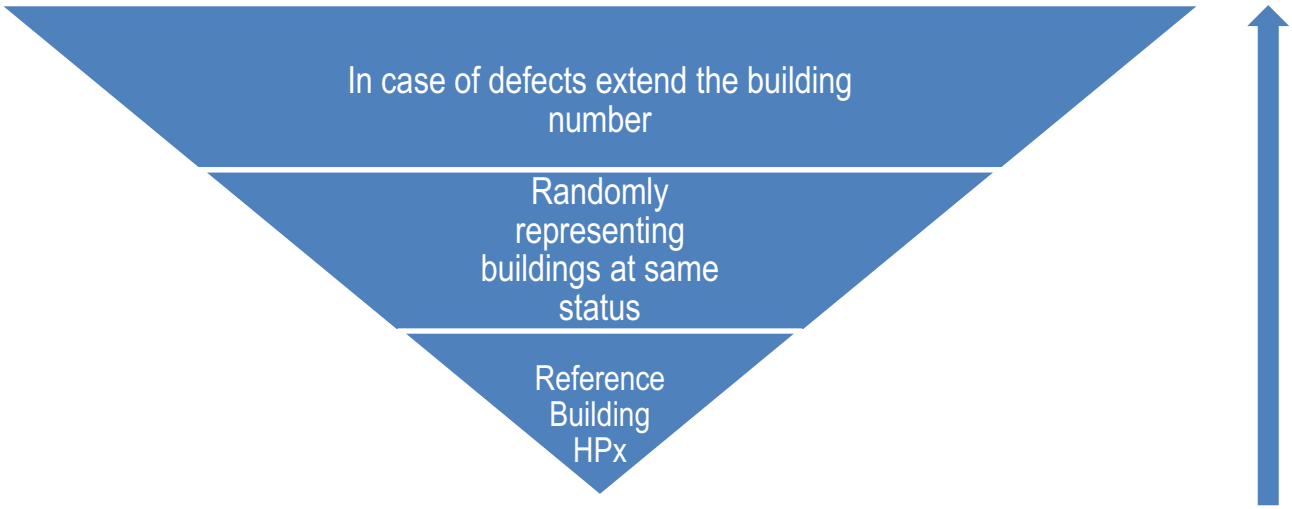
Basic conditions are as follows:
- The inspector has received the approved drawings and planning documents.
- The inspector has received the reinforcement plans.
- The inspection scope applies for multi housing projects with homogenius structures.
- The reinforcement work (reinforced concrete) must be approved by a structural engineer.



8 inspections (incl. handover) as applicable for the Individual Model should be carried out as well during the construction of the multi housing project. The difference is in defined spot check inspections carried out in selected buidlings according to the construction phase. Unlike the construction inspections of a detached house / individual dwelling unit, where the inspections must be carried out at precise times, the scheduling for a construction project where several buildings are being built is more flexible.

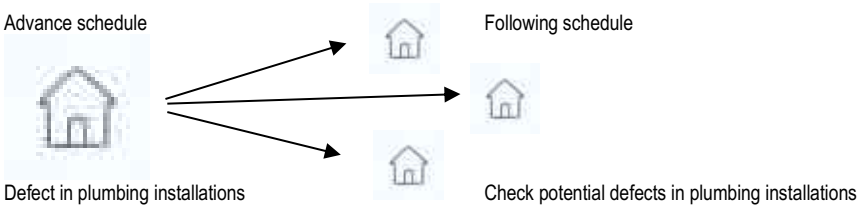
The minimum number of buildings to be inspected for each holdpoint and to achieve a representative result can be defined according ISO 2859. A practical approach can be achieved using the root-function (n=$\sqrt{N}$) of the building number and random selection. The process in building selection and start of an inspection is as the following:

I. Receive information of holdpoint 1 building status by the developer.
II. Start with this first building and proceed with following buildings until reaching a randomly selected representative number of building in the same construction state.
III. Proceed with any further holdpoint in the same way.
IV. In case of defects proceed with additional buildings in the same building state and check for repititions in regards of serial defects
V. Write one aggregated report for the Holdpoint inspection for the selected buildings and state transferability to the full building number.



At least one building is always ahead of the other buildings in terms of the construction schedule. The inspection dates are therefore based on this building. Structural elements or methods of construction that could not be examined in this building, since they were already concealed, can however be examined in a building in which the works are scheduled later.

Findings regarding the execution obtained from the inspections of the “advance” scheduled building can be directly transferred to the “following” scheduled buildings to exclude potential serial defects.



The developer is responsible to call for the respective holdpoint inspections. Here the inspector must obtain information about the construction schedule and the scheduled dates and deadlines on the construction site by the developer. The inspection dates can be roughly planned based on a time schedule and in consultation with the site engineers.

6.0 Inspection Framework and Holdpoints Specifications

The framework for inspection holdpoints defines the handling procedure to schedule the inspection as well as to precise the technical crafts to be assessed.

6.1 Holdpoints

Inspection of craftmanship to be done at Holdpoint 1
The quality and standard conformity of the following subsection-works will be surveyed:

The following construction status should thus be reached:
- Strip and single pad foundations (footings) are not concreted.
- The drainage pipes are installed.
- The foundation earth electrode is installed.

Subsection Civil works
- Earthworks / foundations
  - Subsoil compaction
  - Battered slopes

- Reinforced concrete work
  - Dimensions (width, thickness) of the reinforced concrete members
  - Reinforcement, reinforcement layout / formwork

Subsection Mechanical works
- Drainage sewer work
  - Pipe material, pipe joint
  - Slope
  - Bedding material
  - Pipe cover/backfill

Subsection Electrical works
- Foundation earth electrode
  - Location and laying of the foundation earth electrode
  - Connection to the reinforcement

Note
Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on the construction site:
The foundations are reinforced but not concreted. The ground slab is not yet reinforced and concreted. The drainage sewers/pipes have been installed in the area of the still to be concreted ground slab. An inspection must be carried out of the construction status described above, since at this time the execution of the relevant elements can be examined.
The time of the inspection must therefore always be chosen so that the inspector can see as much of the elements to be examined as possible during an inspection, and they are not yet completely concealed by other members.

Inspection of craftmanship to be done at Holdpoint 2

The quality and standard conformity of the following subsection-works will be surveyed:
The following construction status should thus be reached:

- Strip and single pad foundations (footings) are concreted.
- The drainage pipes are installed.
- The foundation earth electrode is installed (if required).
- The formwork has been installed for the grade beams; the beams reinforcement is completed.
- However, the grade beams have not yet been concreted.

Subsection Civil works

- Earthworks / foundations
  - Soil compaction
  - Battered slopes

- Reinforced concrete work
  - Dimensions (width, thickness) of the reinforced concrete grade beams.
  - Reinforcement, reinforcement layout / formwork.
  - Concrete cover and lean (plain) concrete.
  - Fire wall, requirements (if required).
  - Cleanliness of the formwork.
  - Concrete cover.
  - Concrete quality.

Subsection Mechanical works

- Drainage sewer work
  - Pipe material, pipe joint
  - Slope
  - Bedding material
  - Pipe cover/backfill

Note:

Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:
The foundations are reinforced and concreted. The ground slab is not yet reinforced and concreted. The drainage sewers/pipes have been installed. An inspection must be carried out of the construction status described above, since at this time the execution of the relevant elements can be examined.
The primary objective of this inspection is to check the reinforcement and formwork for grade beams. Consequently, the formwork and reinforcement work in the area of the grade beams must be completed. The concrete for the grade beams should not be poured until after the inspection.

Inspection of craftmanship to be done at Holdpoint 3
The quality and standard conformity of the following subsection-works will be surveyed:

The following construction status should thus be reached:
- Reinforced concrete work (bearing structure) is completed up to the ground floor.
- The formwork has been installed for the ceiling above the first floor, the ceiling reinforcement is completed.
- However, the ceiling has not yet been completed.
- The waterproofing works are being carried out.

Subsection Civil Works
- Reinforced concrete work
  - Fire protection, sound and thermal insulation requirements
  - Dimensions (width, thickness) of the reinforced concrete members
  - Reinforcement, reinforcement layout
  - Cleanliness of the formwork
  - Concrete cover
  - Concrete quality

- Waterproofing work/tanking
  - Substrate pretreatment (floor and wall surfaces)
  - Welded bitumen (asphalt) sheet material incl. primer coat (bathroom, balcony, terrace)
  - Continuation of the waterproofing vertically, overlapping, fixing of the perimeter
  - Protection of the waterproofing until further work (soil placement) take place

Note
Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:
The primary objective of this inspection is to check the reinforcement and formwork for the first floor. Consequently, the formwork and reinforcement work in the area of the ceiling above the first floor must be completed. The concrete for the ceiling should not be poured until after the inspection. The remaining reinforced concrete elements on the first floor and the ground slab / floor slab are completed.

An inspection must be carried out of the construction status described above, since at this time the execution of the relevant structures and elements can be examined.

Inspection of craftmanship to be done at Holdpoint 4
The execution of the following trades is examined:

The following construction status should thus be reached:
- Reinforced concrete work is completed.
- The masonry work/brickwork has been carried out.
- The pipe installation work is in progress.

Subsection Civil Works

- Reinforced concrete work
  - Fire protection, sound and thermal insulation requirements
  - Dimensions (width, thickness) of the reinforced concrete members
  - Concrete cover
  - Concrete quality

- Masonry work/brickwork
  - Fire protection, sound and thermal insulation requirements
  - Dimensions (width, height) of the masonry
  - Joint between masonry and adjacent structural members
  - Making of openings / chasing for utilities/supply lines (cross-sections)
  - Closing off of openings / chasing after installation in ouside walls and walls with special requirements (fire, air, insulation etc.)
  - Grouting / jointing (pointing) of the masonry with regard to the plastering work

Subsection Mechanical Works

- Water installations
- Wastewater installations
- Gas installations
  - Fire protection and sound insulation requirements
  - Material of the utility / supply pipes
  - Cross-sections of the utility / supply pipes
  - Pipe layout
  - Connection of the utility / supply pipes
  - Fixings of the utility / supply pipes

Subsection Electrical Works

- Electrical installations
  - Fire protection requirements
  - Electric cable material
  - Cross-sections of the electric cables
  - Type of laying (ducts)
  - Laying zones
  - Fixings of the electric cables

Note

Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:

The reinforced concrete work (shell/structure) has been carried out. The exterior and interior masonry walls have been erected. Openings and chasing are made in the masonry walls for the utility/supply pipes and cables. The structure installation work (laying the pipes and electrical cables) is in progress.

An inspection must be carried out of the construction status described above, since at this time the execution of the relevant elements can be examined.

Inspection of craftmanship to be done at Holdpoint 5
The execution of the following trades is examined:

The following construction status should thus be reached:
- The masonry work / brickwork has been carried out.
- The pipe installation work has been completed.
- The recesses, openings and chasing have been closed off.
- Preparatory measures are being carried out for the interior plastering work.
- The waterproofing work (roof terrace, flat roof) are being carried out.

Subsection Civil Works
- Masonry work / brickwork
  - Fire protection, sound and thermal insulation requirements
  - Dimensions (width, height) of the masonry
  - Making of openings / chasing for utilities/supply lines (cross-sections)
  - Closing off of openings / chasing after installation
  - Grouting / jointing (pointing) of the masonry with regard to the plastering work

- Waterproofing work/tanking
  - Substrate pretreatment (floor and wall surfaces)
  - Welded bitumen (asphalt) sheet material incl. primer coat (bathroom, balcony, terrace)
  - Continuation of the waterproofing vertically, overlapping, fixing of the perimeter
  - Protection of the waterproofing until further work (soil placement) take place

- Interior plasterwork
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Closing off of openings / recesses / chasing for utilities/supply lines (cross-sections)
  - Arrangement of expanded metal laths in areas of different building materials
  - Arrangement of angle beads

Subsection Mechanical Works
- Water installations
- Wastewater installations
- Gas installations
  - Fire protection and sound insulation requirements
  - Material of the utility pipes
  - Cross-sections of the utility pipes
  - Pipe layout
  - Connection of the utility pipes
  - Fixings of the utility pipes

Subsection Electrical Works
- Electrical installations
  - Fire protection requirements

- Electric cable material
- Cross-sections of the electric cables
- Type of laying (ducts)
- Laying zones
- Fixings of the electric cables

Note
Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:

The structure installation work has been completed. The chasing and openings in the area of the walls have been closed off. Angle beads are mounted on the interior plastering work, expanded metal laths are arranged in the area of different materials. The waterproofing work in the area of the flat roof and roof terraces has been carried out. The state of the walls must be checked during this inspection in preparation for the beginning exterior and interior plastering work.
n inspection must be carried out of the construction status described above, since at this time the execution of the relevant elements can be examined.

Inspection of craftmanship to be done at Holdpoint 6
The execution of the following trades is examined:

The following construction status should thus be reached:
- The interior plastering work is being carried out or has been completed.
- The exterior plastering work (rendering) is being carried out or has been completed.
- The screed work and dry construction work has been started.
- The painting and decorating work (1st coat) is being carried out.
- Air conditioning system components are being installed.

Subsection Civil Works
- Interior plastering work
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Closing off of openings / recesses / chasing for utilities/supply lines (cross-sections)
  - Arrangement of expanded metal laths in areas of different building materials
  - Arrangement of angle beads
  - Application of bonding agents (if required)
  - Application of the plaster layers
  - Joints (e.g. trowel grooves) in adjacent ceiling areas

- Exterior plastering work/rendering
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Arrangement of expanded metal laths in areas of different building materials
  - Arrangement of angle beads
  - Application of bonding agents (if required)

- Formation of coloured trims or moulding / textures
- Application of the plaster layers
- Joints (e.g. trowel grooves) in adjacent ceiling areas
- Damp-proofing in the base area

- Screed, sealing and dry construction work
  - Sound insulation requirements
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Laying of the perimeter insulation strip
  - Placing the substructure for the screed, laying of the screed
  - Bathroom sealing
  - Dry constructions

- Painting and decorating work (1st coat)
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Application of the 1st coating

Subsection Air-conditiong installation

- Air conditioning system
  - Fire protection and sound insulation requirements
  - Material of the air conditioning ducts
  - Installation of the air-conditioning ducts, joints
  - Insulation of the ducts
  - Fixing of the unit

Note

Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:

The interior and exterior plastering work is almost completed. The screed work is in progress. The first layer of the coating is being applied on the interior walls. Air conditioning system components are being installed.
An inspection must be carried out of the construction status described above, since at this time the execution of the relevant elements can be examined.

Inspection of craftmanship to be done at Holdpoint 7

The execution of the following trades is examined:

The following construction status should thus be reached:

- The painting and decorating work (1st coat) is completed.
- The dry lining / drywall work is being carried out or has been completed.
- The tiling work (indoors and outdoors) is being carried out or has been completed.
- The natural stone work is being carried out or has been completed.
- Door elements including frames are being installed.
- Window elements are being installed.

Subsection Civil Works

- Painting and decorating work (1st coat)
  - Checking the substrate with possible preparatory measures
  - Substrate pretreatment/priming
  - Application of the 1st coating

- Dry lining / dry walling work (mostly suspended ceilings / friezes)
  - Checking the substrate with possible preparatory measures
  - Installation of the substructures
  - Wall sheathing incl. filling/smoothing the sheathing

- Tiling work (indoor area)
  - Checking the substrate with possible preparatory measures
  - Mounting stop beads / angle beads
  - Laying of the tiles including base tiles
  - Jointing of the tiles

- Tiling work (outdoor area)
  - Sound insulation requirements
  - Checking the substrate with possible preparatory measures
  - Dampproofing / waterproofing in the bathrooms
  - Mounting stop beads / angle beads
  - Laying of the tiles including base tiles
  - Jointing of the tiles including base tiles
- Natural stone work (floor)
  - Sound insulation requirements
  - Checking the substrate with possible preparatory measures
  - Laying the natural stone slabs/tiles including base
  - Jointing the natural stone slabs including base

- Carpentry work (doors)
  - Sound insulation requirements
  - Checking the substrate with possible preparatory measures
  - Installation of the frames
  - Joint between the frame and adjacent structural members
  - Installation of the door leaf

- Carpentry work (windows)
  - Thermal and sound insulation requirements
  - Checking the substrate with possible preparatory measures
  - Fixing the window frames, movement option
  - Leaktight jointing of the element on the structure
  - Joining the window frame onto the reveal (note building physics requirements)

Note
Due to the construction progress, it is not always possible to precisely check the state of all structural members during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:

During this inspection, particular attention is paid to examining the execution of the interior finishes. In one part of the building the tiling work (walls and floor) is in progress in the bathrooms. The natural stone is being laid in the rooms. The door frames and the windows are installed. The external works / outdoor areas are in progress.

An inspection must be carried out of the construction status described above, since at this time the execution of the relevant members and elements can be examined.

Inspection of craftmanship to be done at Holdpoint 8
The execution of the following trades is examined:

The following construction status should thus be reached:
- The building should be completed or essentially completed.

NOTE: In addition to the inspection the handover can be made depending on the inspection result – only if no major defects identified.

Subsection Civil Works
- Painting and decorating work (2nd coat)
  - Substrate pretreatment/priming
  - Application of the 2nd coating
- Dry lining / drywall work
  - Completion or residual works
- Tiling work
  - Completion or residual works
- Carpentry work (doors)
  - Completion or residual works
- Metalwork and locksmith work
  - Installation of stair handrails and other railings
- External works
  - Completion or residual works

Subsection Mechanical Works
- Water installations, wastewater installations (fixtures and fittings)
- Gas installations (fixtures and fittings)
  - Installation of the plumbing appliances/appurtenances/fixtures
  - Functional check

Subsection Electrical Works
- Electrical installation (fixtures and fittings)
  - Installation of sockets outlets, light switches
  - Fuse boxes, fuses
  - Functional check

Subsection Air-conditioning Installation

- Air conditioning system
  - Functional check

Note

Due to the construction progress, it is not always possible to precisely check the state of all structural elements during an inspection. From its experience, TÜV SÜD expects to find the following view of construction progress on a construction site:

During this inspection, almost all structural member surfaces can be examined in the completed areas. The handover can also take place in the fully completed building.

7.0 Documentation

Each inspection leads into a final inspection report to be issued:

- By the inspector
- Approved by the third-party inspection agency

There is a total number of 8 reports plus a handover report for each individual building. A final inspection report can be written manually and/or via the electronic portal usage of the Sustainable Building program.

There are also 8 reports for the multi-building projects (Developer Model) plus a handover report for each single building or unit.

The minimum requirements regarding general information are:

- Building Owner
- Buidling or construction number
- Inspectors data
- Date and time of the inspection
- Participants during the inspections
- Date of final inspection report

The minimum requirements regarding technical inspection are:

- Holdpoint Number
- Available documentation
- Object data and weather conditions
- Building or construction status and conditions
- Declaration of actual execution status and used materials
- Findings, defects and notes
- Result of the inspection and verdict

A report template will be provided by the Sustainable Building program electronically as well as interactive via portal access.

فحص
جودة البناء

8.0 Technical Crafts

8.1 Civil/ Structural Work: Substructure - Groundworks and foundation

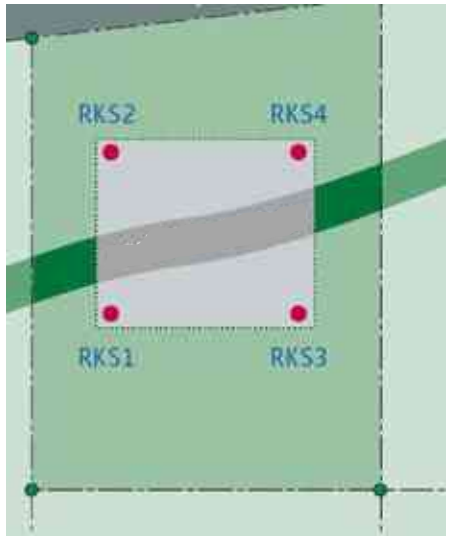
Technical Craft

Groundworks / Foundation

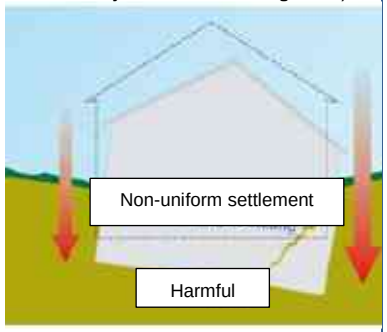
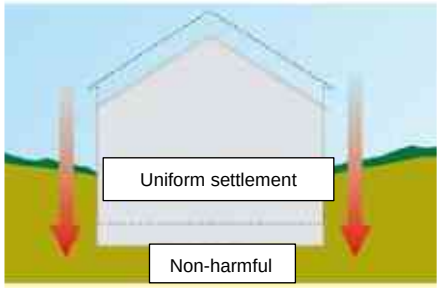
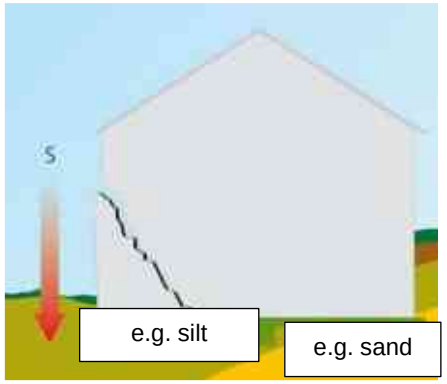
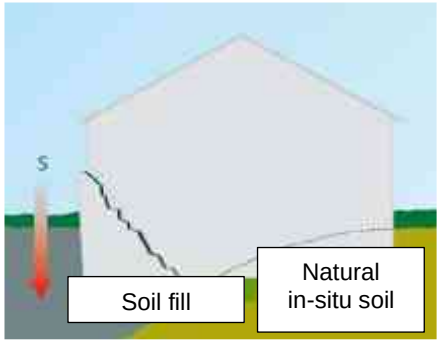
R0010511

R0010512

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Groundworks and foundations	**General information on earthworks / foundations**			
	SBC 1101 Section 3B5 Section 704	General specifications (see CHAPTER 2 "SITE INVESTIGATIONS", SECTION 2.1 GENERAL 2.1.0 Site investigations shall be conducted in conformance with Sections 2.2 through 2.6. Where required by the building official, the classification and investigation of the soil shall be made by a registered design professional. No site investigation report is needed if the building meets the following combined criteria: 1. The net applied load on the foundation is less than 50 kPa. 2. There are no dynamic or vibratory loads on the building. 3. Questionable or problematic soil is not suspected underneath the building. 4. Cavities are not suspected under the footing of the building.	- SBC 303 does not apply to pressure water loading due to wind and waves, then SBC 301 (test within the scope of the design/building permit procedure) -	Question: According to the design, only strip footings in the construction area. Are other foundation methods planned / required? Load transferred by foundation slabs? Soil exchange? Is the foundation also achieved with reinforced concrete beams in different soil conditions? Do these exist on the site? Is SABKHA soil present within the construction area?
		The owner or applicant must submit information on the soil conditions on site (site investigation / soils report) to the building official for approval (see Chapter 2.2), unless: - Sufficient data on the soil is available; - Results of site investigations of adjacent areas can be used; It is necessary to determine where the groundwater level lies (design water level). If indications exist that the soil does not have the required load-bearing capacity, sample borings (dynamic cone penetration tests (standard	Site supervision task: - Check soil conditions, compare with list of criteria; - Contact structural engineer to clarify their assumptions; - If necessary, arrange site investigation; - Clarify design water level;	Question: Are there any known karst formations/cavities in the soil? If yes, then site investigations are mandatory – may be required by the building official. Question: Are there known seismic activities within the construction area? Question: What subsoil exists on site, sand? Question: Have cellars been built, not identifiable on photos?

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		penetration tests)) must be performed to a depth of at least 3 m below the foundation level.		
		Classification of soils and investigations – see Chapter **2.3 „SOIL CLASSIFICATION“ to SECTION 2.5 „SOIL BORING AND SAMPLING“.** **SECTION 2.6 - REPORTS** 2.6.1 The soil classification and design load-bearing capacity shall be shown on the construction document.	- Important for structural design – site supervision: Check for plausibility “correspond to the structural engineer’s assumptions”, if checking engineer is not involved.	Recommended soil investigations:  RKS 1-4 = cone penetration tests  right side : Missing foundation below the masonry wall

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes

		General additions:
		- Excavations and bottom of footing: Changes under weather conditions:
		  - Swelling possible in case of rain, reduction in the load-bearing capacity of the near-surface layer as a result;
		  - Consequence: different settlements;
		- Ground slabs and foundation trenches excavated too deep, therefore fill material required, additional compaction work necessary on bottom of excavations;
		- Settlement (pressing together of voids in the soil) – how is foundation made – strip footings or load transferring ground slab;
		- Settlement reduces over time, faster in non-cohesive soils than in cohesive soils;
		- Uniform settlement is not harmful for the structure;
			- Check excavation depths and excavation dimensions;
			- Test the bottom of the ground slab after rain;
			- Which soils are found with which thickness?
			- Check the positions of the strip footings (different settlement can occur if they are too close together);
			 
			
				
				
				 
				
				Different soils – different settlements.
				 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				Different settlement if the filled soil is compacted inadequately.
	Earthworks			
		Preliminary work/ checks: - Excavation / foundations must be set out in accordance with the permit;	- Check the setting out points and level and position of the utility pipes and cables / drainage;	
		Earthworks (excavation, store, fill) – permit required, except (Section 3.2.0): 1. self-contained area, no apparent danger to private or public property; 2. exploratory excavations under the direction of geotechnical engineers; 3. excavation, which (a) is less than 600 mm deep, or (b) if excavation slope is not longer than 1.50 m, with ratio of 3 (horizontal) to 2 (vertical); 4. the fill material is placed with 30 cm per layer, on natural terrain with a slope of maximum 5 (horizontal) to 1 (vertical) or less than 1 m deep; 5. max. 40 m³ soil fill, if the fill is not placed under foundations/ ground slabs; 6. no drainage courses are obstructed;	- Measurement of the excavation / excavation of strip footings and comparison with design and permit, if necessary obtain permit for earthworks.	Question: Is surface drainage planned for the in-situ soils?
		The following must be noted during the earthworks: - Groundwater level; - Soil properties Drainage sewers and wastewater constructionsRetaining walls/Cantilever walls - Location of adjycent buildings or structures		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Fill material must be free from organic material, construction debris, cobblesand boulders; - Fill and compact in layers; - Damage to foundations and the waterproofing or dampproof system is to be avoided; - The surface of the ground at the foundation must be sloped away from the building at a slope of 5% for a minimum distance of 3 m measured perpendicular to the face of the wall, so that surface water is diverted away from the foundation; Exception: in favourable climatic conditions, little rain, the slope can be reduced to 2%;	- Inspection of the waterproofing works to SBC 302; - Clarification of the load-bearing capacity of the bottom of the foundation based on Table 4.1 and SBC 301 Chapter 2.4 – task of the structural engineer (design),	 Construction material and building rubble obviously placed in excavations must be removed.  Excavated soil contaminated with construction waste.
				

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Foundation			
		- Minimum depth of foundations/footings in natural soils (Section 5.2): - Cohesive soils 1.2 m; - In silty and clayey soils 1.5 m; - In rock 60 cm to 1.2 m, depending on the thickness of the rock layer; - If necessary, foundation depth according to Sections 5.2.1 to 5.2.3 or the structural calculations;	- Check execution against design: - Foundation depth; - Foundation trench width; - What is stated in the structural calculations?	Strip footings and column footings are planned according to the design – is that correct? Embedment depth approx. 20 „“ ≈ 50 cm; Question: Are foundations also made of rubble stone? Question: Are strip footings also made of masonry (concrete blocks) or only made of concrete? Question: Are piled foundations used?
		- Concrete foundations may not be under water during concrete placement or the soil under foundations washed away by water; - Minimum concrete cover of the reinforcement. If the foundation concrete is cast directly on the soil or against excavation walls, the minimum concrete cover must be at least 75 mm. The concrete cover must comply with the requirements in relation to the specific exposure conditions, -	- Check the spacers / required concrete cover;	
		- Construction joints must be sealed appropriately, see Waterproofing trade;	- Planning of construction joints / concreting sections required;	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Geotechnical Investigation **SBC 1101 Section 704** **SBC 303 Section 2.4 Section 2.5**	**Penetration tests** Two types of penetration tests shall be considered: 1) SPT—The SPT (Standard Penetration Tests) consists of counting the number of blows N necessary to produce 300 mm penetration of a standard split spoon into the soil. Standard weight used in the test is 64 kg, and it is dropped from a standard height of 750 mm. 2) Cone penetration test (CPU)—The CPT consists of pushing a 60-degree cone of 1000 mm base area into the soil at a constant rate of 20 mm/s. The force needed to advance the cone divided by the base area is the cone resistance qc. **If possible, standard penetration tests, SPT, shall be performed at all sites.** **Soil boring and sampling:** • The soil boring and sampling procedure and apparatus shall be in accordance **with generally accepted engineering practice.** • The **registered design professional** (RDP) shall have a **fully qualified representative** on the **site** during all boring and sampling operations. • Number of boreholes shall be **selected** by a RDP based on variations in site conditions, and **contractor shall advice** if additional or special tests are required.	• Is the penetration test for soil inspection approved by RDP?	  **Registered design professional** (RDP) **in Responsible charge** is a registered design professional engaged by the owner or the

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			owner's authorized agent to review and coordinate certain aspects of the project, as determined by the building official, for compatibility with the design of the building or structure, including submittal documents prepared by others, deferred submittal ocuments and phased submittal documents.
	The soil report		
	The soil report **shall contain information-** but need not be limited the following information- related to: a) Location b) Site topography c) Stratigraphy d) Groundwater elevation e) Ground surface elevation f) Local conditions needing special consideration such as: • soil strength, • compressibility, • expansion potential, • comments on collapsibility, • liquefaction potential, and • local history of the performance construction methods. g) Chemical properties of encountered soil and ground water. h) Proposed excavation support system (in case of basement).	• Does the soil report contain the related information?	
	Boreholes		
	Number of boreholes: • The minimum number of boreholes in a given site shall be taken in accordance with **Table 2-1** of SBC 303.	• Is the minimum number and depth of boreholes in accordance with Table 2-1 of SBC 303? • Is the minimum number of boreholes less than (3) boreholes?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• The values included in Table 2-1 shall be considered as **minimum guideline**. **Depth of boreholes:** The **depth** of boreholes **shall cover all strata** likely to be **affected** by: - The loads from the building and - adjacent buildings. The **minimum** depth of boreholes shall be taken from **Table 2-1** of SBC 303. • According to **Table 2-1**: - The **Minimum** acceptable **number** of boreholes shall **not be less than (3)** boreholes. - The **Minimum depth** of two-third of the boreholes shall **not be less than (4) meters.** - Depth is **measured** from the level of **foundation bottom** not the grade level. - The **Minimum depth** of one-third of the boreholes shall **not be less than (6) meters.** - If possible, standard penetration tests, SPT, shall be performed at all sites.	• Is the minimum depth of two-third of the boreholes less than (4) meters? • Is the minimum depth of one-third of the boreholes less than (6) meters? • Is the depth of boreholes measured from the level of foundation bottom?	 (Copy from SBC 303, page 35)
	Excavation near foundations		
	Where **excavations** will **reduce support** from any foundation, a registered design professional **(RDP) shall prepare an assessment** of the structure as determined from examination of the structure, the	• Will excavations reduce support from any foundation? • Is the supporting of foundation carried as per the RDP assessment report?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	review of available design documents and, if necessary, excavation of test pits. The RDP shall determine the requirements for underpinning and protection and prepare site specific plans, details and sequence of work for submission. Such support shall be provided by underpinning, sheeting, and bracing, or by other means acceptable to the building official.		

Example: Foundation Workflow

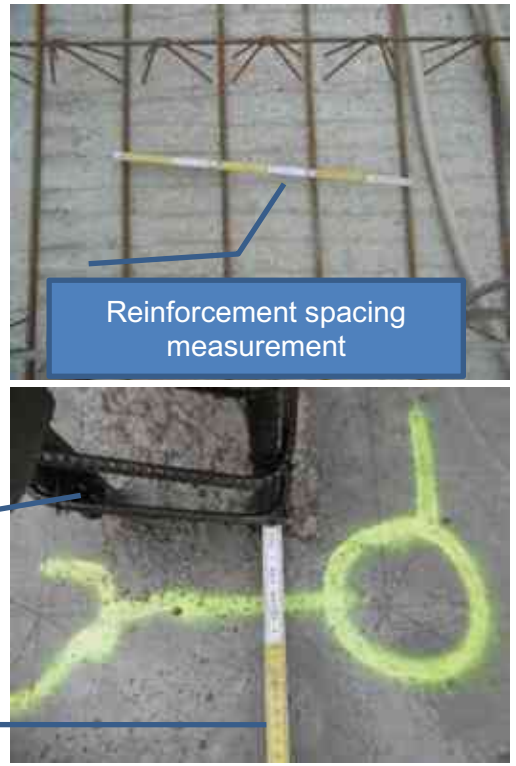
8.2 Civil / Structural Work : Superstructure - Technical Craft Concrete / Reinforced concrete

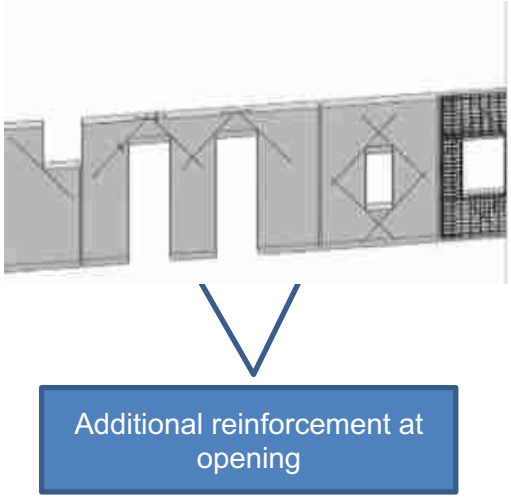
Technical Craft

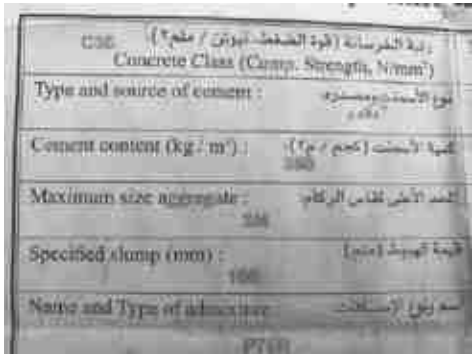
Concrete / Reinforced Concrete Superstructure

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Reinforced concrete work General information	**Preparation**			
	Construction documents SBC 1101 Section 3A5	Completeness of the documents as preparation for the execution	- Checking of the design documents for completeness (e.g. architecture's drawings, formwork and reinforcement drawings with checking engineer's stamp)	
	Construction documents SBC 1101 Section 7A8	Structure	Inspection of structural layout and members dimensions for compliance with approved design drawings and construction tolerances 	
	SBC 1101 Section 4A5	Formwork	- Checking the formwork for cleanliness, stability and plumbness.  - Check the number, thickness and location of the spacers.	 Ties of wall shuttering

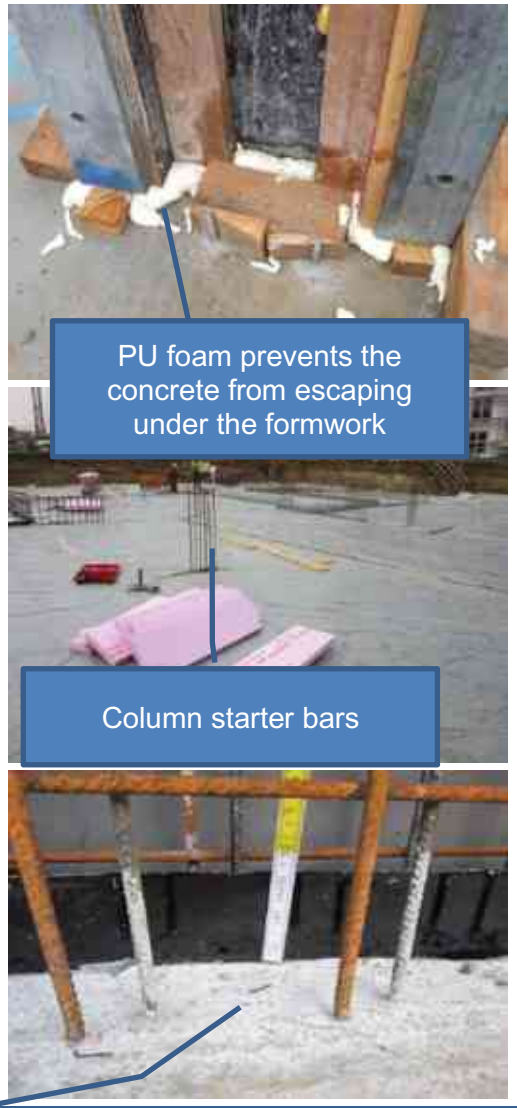
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			- Check whether holes and openings have been created correctly and the built-in parts have been installed. - Substrate such as blinding layers, etc. may have to be pre-wetted, especially in high temperatures, and/or non-absorbent formwork must be used. However, puddling is to be avoided. The formwork must be prepared with formwork lubricant. - Construction joints, e.g. between foundations and rising columns are to be clearly bound by expanded metal formwork, which is concreted in place, and with trapezoidal or triangular fillets (chamfer strips). 	  

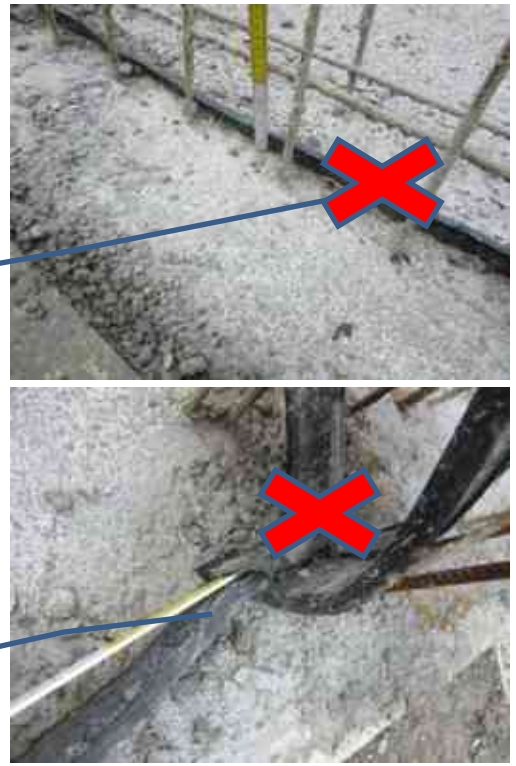
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1101	Reinforcement	Inspection of formwork - Check whether the correct reinforcement has been installed with the correct dimensions in the correct place. The number, dimensions, location and spacings and the overlap lengths of the reinforcement must be checked against the checked reinforcement plans. - Particular attention must be paid to whether the required concrete cover is achieved. - Check whether any starter reinforcement required for other members has been installed. - Check fresh concrete packed properly to avoid cavity and rock pockets	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			- Additional reinforcement is generally required in the area of openings and recesses as well as holes. The installation must be checked.	 No proper packing, rock pockets and cavity risk
			Inspection of reinforcing steel, including prestressing tendons, and placement.	

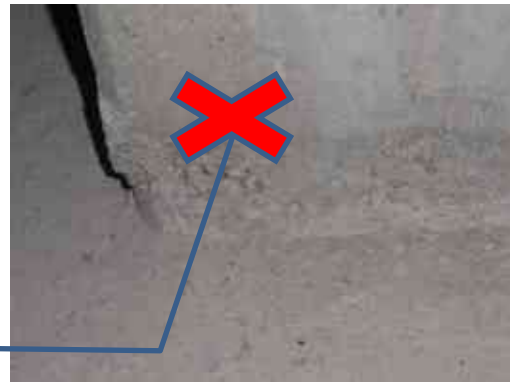
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1101	Concrete	- Check (using delivery notes), whether the required concrete quality is delivered and installed. - Check the w/c ratio Inspection of concrete mix a. Verify the use of required design mix b. Verify that the delivery is from certified batch plant	 *Concrete delivery notes*
			Concrete samples At the time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and determine the temperature of the concrete.	
		Concrete placement / concreting	Preparation / monitoring of the concreting process - Check whether defined concreting sections have been complied with. - The concrete surface must be roughly profiled in the area of construction joints. Remove dirt before concreting further. Fresh concrete must be sprayed off with a strong jet in the area of construction joints, older concrete is to be roughened using jet spray or steel brushes and kept damp for several days before concreting the topping. A concrete jointing mix with max. particle size 0-8 mm is to be used to obtain a firm bond between the already concreted and the new	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			concreted section without air bubbles and gravel pockets in the area of the construction joint.	
	SBC 1101 Section 4A4	Hardening / curing	- Checking of the suitable curing methods, in particular, extra measures for high temperatures, e.g. to prevent shrinkage cracks Inspection of curing techniques and hot weather requirements.	
		Stripping/removal of the formwork	- Testing the concrete strength before stripping the formwork - Check the dimensions, position and form of the structural members built and compare with the checked plans.	 *Thickness of plain concrete*
Blinding layer		Substrate for erecting the formwork and the reinforcement of the foundations	**Special features / additional tests and inspections:** - Checking the load-bearing capacity and cleanliness of the substrate before pouring the concrete for the blinding layer. The evenness of the blinding layer must be ensured by screeding.	

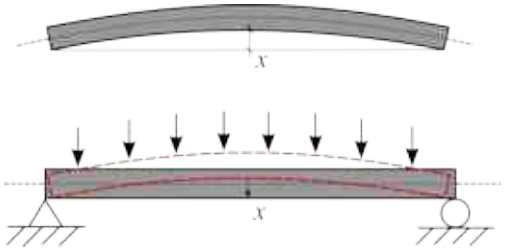
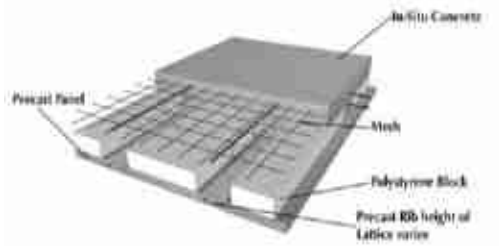
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Single pad foundations (footings) / strip foundations		Load-bearing structure for supporting the load of the building 	- Check whether any pipes to be installed are present. - Leaking of the concrete under the formwork in case of uneven levels and unevenness in the substrate (ground) or blinding layer must be prevented by closing the joints, e.g. with PU foam. - Check whether possibly required starter bars for columns and walls have been installed. - Check whether the defined concreting sections were complied with. - Check whether aids are necessary to seal the construction joints of rising structural members such as walls and columns, e.g. joint tapes, metal jointing strips are necessary, are installed in the middle of the construction joints and have been welded at the butt joints.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			Jointing tape installed too deep or gaps Jointing tape joint open	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1102 Section 3602	Lightning protection/earthing	- Check, whether foundation earth electrodes are required and have been installed. Lightning protection/foundation earth	
Reinforced concrete work **Columns/walls** Columns / walls		Load-bearing structure for carrying loads of point / strip loads	**Special features / additional tests and inspections:** - Check whether masonry joint strips are required and have been installed in the correct places. - Check whether triangular fillets (chamfer strips) are required and have been installed to chamfer the edges? Joint tube - Check whether joint tubes are necessary and have been properly installed.	 Chamfered edge 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			- After the stripping of the formwork, check the surface of the concrete with regard to the contractual agreements, cavities and gravel pockets.	
Reinforced concrete work **Foundation / non-load-bearing ground slab** Blinding layer		Substrate for erecting the formwork and the reinforcement of the foundations	**Special features / additional tests and inspections:** - Checking the load-bearing capacity and cleanliness of the substrate before pouring the concrete for the blinding layer - The evenness of the blinding layer must be ensured by screeding. - Check, whether required joints have been designed and have been executed.	
Ground slab		Load-bearing structure / non-bearing concrete slab as flooring substrate	- Check, whether earthing connecting lugs have been set and fixed securely in position. - A plastic sheeting must generally be laid on the blinding layer, so that the slab can slide. The ground slab must generally be separated vertically from the foundation by insulation in the support area.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			- Compared to their volume, ground slabs have a large surface, which can lead to faster evaporation of the surface moisture of the concrete and thus to so-called “burning”. It must be ensured that the concrete, especially its surface, does not dry too quickly, e.g. using tarpaulins as protection from direct sunshine, by laying plastic sheeting on and by wetting the surface.	
	SBC 1102 Section 3602	Lightning protection/earthing	- Check whether foundation earth electrodes are required and have been installed.	
Reinforced concrete work **Beams/upstand beams** Beams/upstand beams		Structure for supporting strip loads, e.g. from floors/ceilings or cantilevered members	**Special features / additional tests and inspections:** - Check whether the concrete reaches into all corners and between the reinforcement, whether it is adequately compacted and whether air bubbles and gravel pockets and segregation of the concrete are avoided. The reinforcement is generally laid very close together in the support area. - After the stripping of the formwork, check the surface of the concrete with regard to the contractual agreements, cavities and gravel pockets.	 *Check concrete surface with regard to the contractual agreements, cavities and gravel pockets.*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Reinforced concrete work **Ceilings** Ceilings		Structure Precast system with in-situ concrete for ceilings / Hollow-block system	**Special features / additional tests and inspections:** - Where possible, the ceiling formwork must be supported in all directions and protected against toppling. Compliance with the requirements from the formwork plans must be checked to avoid accidents. - Compared to their volume, ceilings have a large surface, which can lead to faster evaporation of the surface moisture of the concrete and thus to so-called “burning”. - It must be ensured that the concrete, especially its surface, does not dry too quickly, e.g. using tarpaulins as protection from direct sunshine, by laying plastic sheeting on and by wetting the surface. - In case of larger spans of ceilings, it may be necessary to camber the formwork due to the expected deflections and to prevent resulting cracks. Inspection of specification and drawing conformity, structural calculations.	  

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Reinforced concrete work **Ceilings** Stairs		Structure for bridging the gap between stories	**Special features / additional tests and inspections:** - The height of the steps must be checked - Especially for stairs, before concreting the overlapping lengths of the starter reinforcement and the stair reinforcement must be checked. - For sound insulation reasons, it may be necessary to separate the supports of the stairs from adjacent structural members. - The installation of appropriate impact sound insulation (brand name “Tronsoles”) must be checked. It is necessary to check whether, for example, soft insulation has been installed in the joint as separation between the stairs flight and walls.	 *The height of the steps must be checked* 

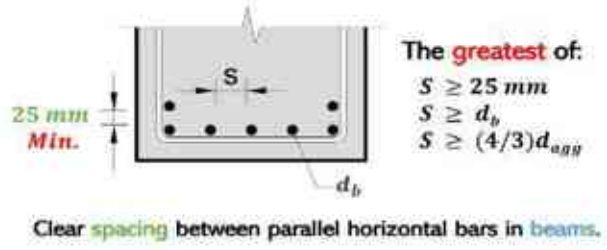
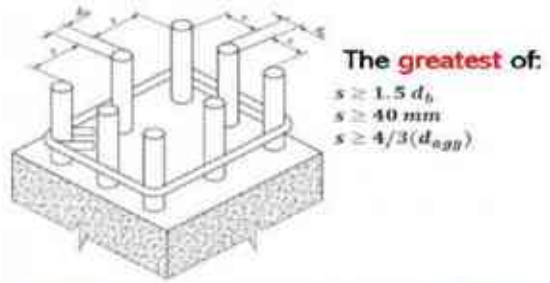
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			No separation exists between the flight of stairs and wall	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
DRAWINGS **SBC 1101** **SECTION 7A9**	Building construction encompasses several types of drawings, each depicting an important part of the project. These drawings cover all phases of the work necessary for the finished structure and are described as follows: 1. Site drawings or plot plans depict. 2. Architectural drawings 3. Structural drawings 4. Mechanical drawings 5. Electrical drawings **Structural drawings** shall be divided into: 1) General structural drawings 2) Detailing or placing drawings and related schedules. **Structural** drawings shall be signed by the **licensed design professional**.	• Are all required drawings attached? • Is detailing drawings and related schedules attached? • Is the site investigation report attached? • Is the statement of special inspections attached? • Are the structural drawings signed by the licensed design professional?	**licensed design professional** is an individual who is: 1. **Licensed** to **practice structural design** as defined by the statutory requirements of the professional licensing laws of the country or jurisdiction in which the project is to be constructed, 2. In responsible charge of the structural design.
CONCRETE MIXING AND PLACING **SBC 1101** **SECTION 4A4**	**Durability of concrete:** **Durability** of concrete is impacted by the resistance of the concrete to **fluid penetration.** This is primarily affected by: • **w/c** (water to cement ratio) and • the composition **of cementitious materials** used in concrete. For a given w/c, the use of: • fly ash, • slag cement, • silica fume, or • a combination of these materials	• Is the w/c ratio per the licensed design professional requirement? • Is the composition of cementitious materials used in concrete per the licensed design professional requirements? • Is the concrete plant approved by SASO?	

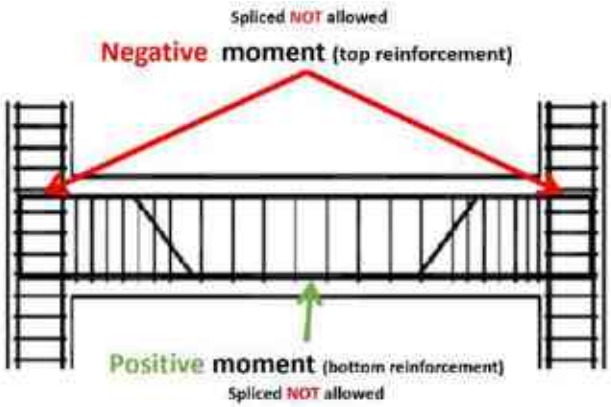
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	will typically **increase the resistance** of concrete to fluid penetration and thus **improve** concrete durability. The Code places emphasis on w/c for achieving low permeability to meet durability requirements. **ASTM C 1202** can be used to provide an indication of concrete's resistance to fluid penetration.		
	Concrete workability:		
	The term **"without segregation"** is intended to provide for a cohesive mixture in which **aggregates remain well distributed** while the concrete is in its fresh state. It is recognized that some segregation in the form of **bleeding will occur**. The required **workability** will depend • reinforcement congestion, • geometry of member, • placement method, • and consolidation methods to be used. Construction requirements of the contractor should be considered in establishing required workability of the concrete. A slump test is a method to test the concrete workability to minimize **segregation**. Slump test of concrete placed in removable forms shall **not exceed 150 mm**. Slump test of concrete shall be determined in accordance with **ASTM C143**.	• Is the concrete workability per the licensed design professional requirements? • Is slump test of concrete determined in accordance with ASTM C143? • Are the slump test results per the licensed design professional requirements?	

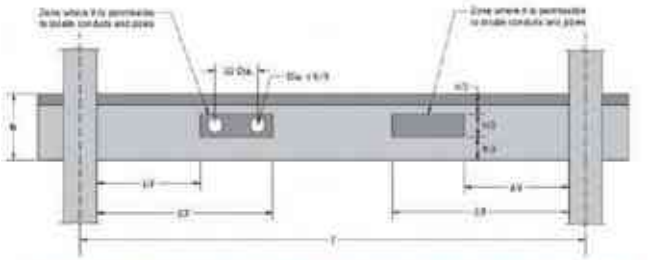
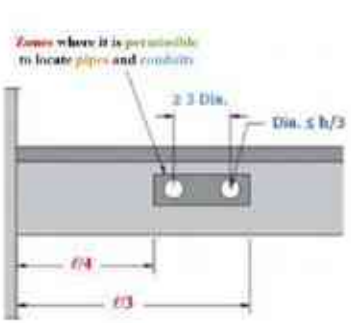
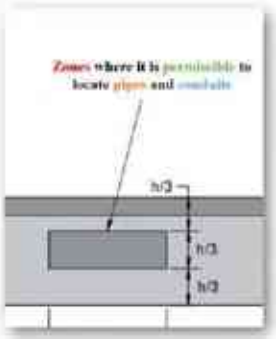
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
STEEL REINFORCEMENT PROPERTIES **SBC 1101** **SECTION 4A6** **SECTION 4A7** **SECTION 508** **SECTION 5B8** **SECTION 5C8** **SECTION 7A3**	**Material properties:**		
	Reinforcing bars and wires shall be **deformed.** **Exception:** Plain reinforcing bars or wires are permitted for use in **spirals**. **Deformed** bars of carbon steel & **plain** bars for spiral reinforcement shall conform to **ASTM A615.**	• Are the reinforcing bars and wires deformed**?** • Are the reinforcing bars and wires conform to **ASTM A615?** • Is the manufacturer of the reinforcing bars and wires approved by **SASO**?	**Deformed** reinforcing bars has a ribbed surface and is used typically to apply tension within reinforced concrete structures because it has a higher tensile strength than regular reinforced steel bar.  Deformed reinforcing bars
	Durability for steel reinforcement:		
	Specified concrete cover: For **Cast-in-place** concrete members, Unless the Code requires a greater concrete cover for **fire protection**, the minimum specified concrete cover for reinforcement shall be at least that given in **Table 4A-5.** **Corrosive environments:** Where concrete will be exposed to external sources of **chlorides** in service, such as brackish water, seawater, or spray from these sources, **concrete** should be proportioned to satisfy the requirements for the applicable **exposure class** in CHAPTER 4(A) of SBC 1102. These include: • maximum w/c, • minimum strength for normal weight, • maximum chloride ion in the concrete.	• Is the minimum concrete cover for reinforcement per the licensed design professional requirement but not less than that given in Table 4A-5? • Is the reinforced concrete exposed to corrosive environments?	 **Concrete cover** is a protection of steel reinforcement from weather and other effects.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Additionally, for corrosion protection, a specified **concrete cover** is recommended for reinforcement for: • Walls and slabs: not less than **50 mm.** • Other members: not less than **65 mm.**		 Table 4A-5 Specified concrete cover for cast-in-place concrete members Concrete exposure / Member / Reinforcement / Specified cover, mm Cast against and permanently in contact with ground — All — All — 75 Exposed to weather or in contact with ground — All — Dia 19 through Dia 32 bars — 50 Exposed to weather or in contact with ground — All — Dia 16 bar, MW200 or MD200 wire, and smaller — 40 Not exposed to weather or in contact with ground — Slabs, joists, and walls — Dia 25 bar and smaller — 20 Not exposed to weather or in contact with ground — Beams, columns, pedestals, and tension ties — Primary reinforcement, stirrups, ties, spirals, and hoops — 40* *30 mm. It shall be permitted to consider concrete floor finishes as part of required cover for structural purposes. (Copy from SBC 1101, page 361) The condition **"exposed to weather or in contact with ground"** refers to **direct** exposure to **moisture changes** and not just to temperature changes. Slab soffits are not usually considered directly exposed unless subject to alternate wetting and drying, including that due to condensation conditions or direct leakage from exposed top surface, run off, or similar effects. 

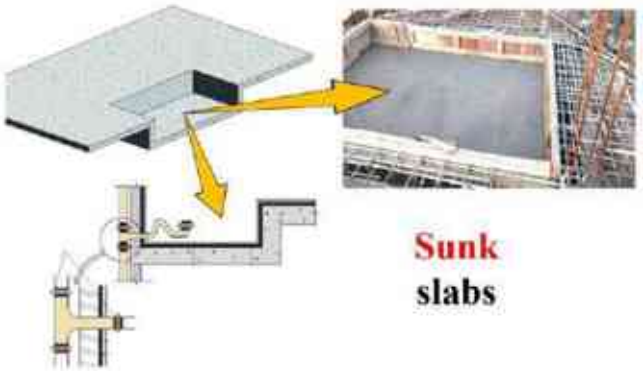
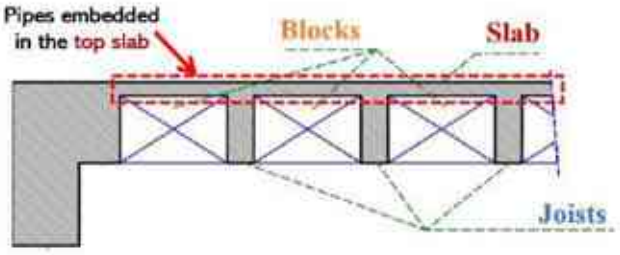
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			Concrete cover is **measured** from the concrete surface to the **outermost surface of the reinforcement** to which the cover requirement applies. Where concrete cover is prescribed for a class of structural members with transverse reinforcement, Concrete cover is measured to the **outer edge of stirrups**, **ties, or spirals.**
	Minimum spacing for reinforcements		
	The minimum limits of **reinforcements spacing** are set to permit concrete to flow readily into spaces: 1. between bars and 2. between bars and forms without **honeycombs**, and to ensure against concentration of bars on a line that may cause shear or shrinkage cracking. **Horizontal parallel reinforcement:** For parallel reinforcement in a horizontal layer, clear **spacing** shall be at least the **greatest** of: • 25 mm, • d_b, and • $(4/3)d_{agg}$ **Horizontal parallel reinforcement in two or more layers:** For parallel reinforcement placed in **two or more** horizontal layers, reinforcement in the **upper** layers shall be placed **directly** above reinforcement in the bottom layer with a **clear spacing** between layers of **at least 25 mm.**	Are the minimum limits of reinforcements spacing meet the code requirements for: • Horizontal parallel reinforcement? • Longitudinal parallel reinforcement? • Solid slabs reinforcement?	 Clear spacing between parallel horizontal bars in beams. d_{agg}: nominal maximum size of coarse aggregate in mm. d_b: nominal diameter of bar, wire, prestressing strand in mm.  Clear spacing between longitudinal bars in columns. (Copy from SBC 1101, page 753) d_{agg}: nominal maximum size of coarse aggregate in mm. d_b: nominal diameter of bar, wire, prestressing strand in mm.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Longitudinal parallel reinforcement: For longitudinal reinforcement in columns, and boundary elements in walls, **clear spacing** between bars shall be at least the **greatest** of: • 40 mm, • $1.5d_b$, • $(4/3)d_{agg}$. **Solid slabs reinforcement:** For reinforced concrete **solid slabs**, **maximum** spacing s of **deformed longitudinal** reinforcement (**primary flexural** reinforcement) shall be the **lesser** of **2*h (slab thickness) and 200 mm.** This limitation is to ensure slab action, control cracking, and provide for the possibility of loads concentrated on small areas of the slab**.** The requirement that the **center-to-center spacing** of the reinforcement be not more than **two times the slab thickness** applies only to the reinforcement in **solid slabs, and not to reinforcement in joists or waffle slabs**.		 Solid slabs  Primary flexural reinforcement (bottom rebar)  One-way joists slabs  Waffle or ribbed slabs

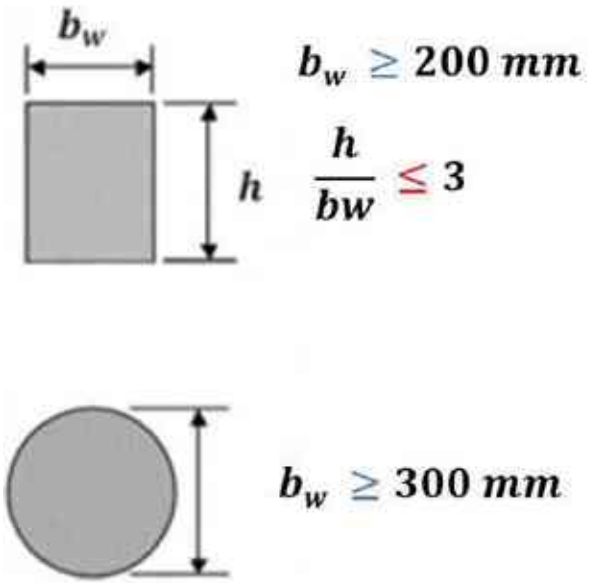
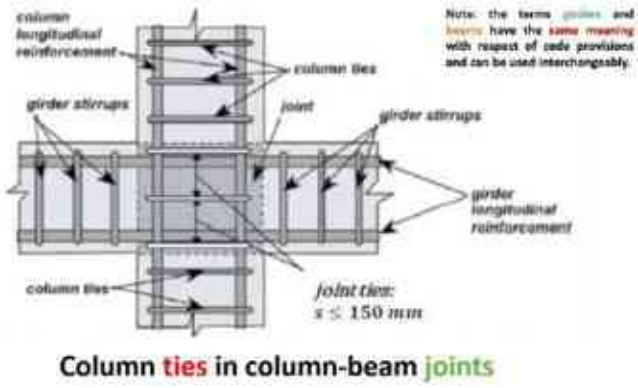
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Splice requirements		
	If **splices** are necessary **in continuous structural integrity reinforcement**, the reinforcement shall be spliced in accordance with (a) **and** (b): **(a)** **Positive** moment reinforcement shall be spliced **at or near the support.** (b) **Negative** moment reinforcement shall be spliced **at or near midspan.**	• Are splices locations in structural integrity reinforcement? • Are critical splices in positive moment reinforcement at or near the support? • Are critical splices in negative moment reinforcement at or near midspan?	 

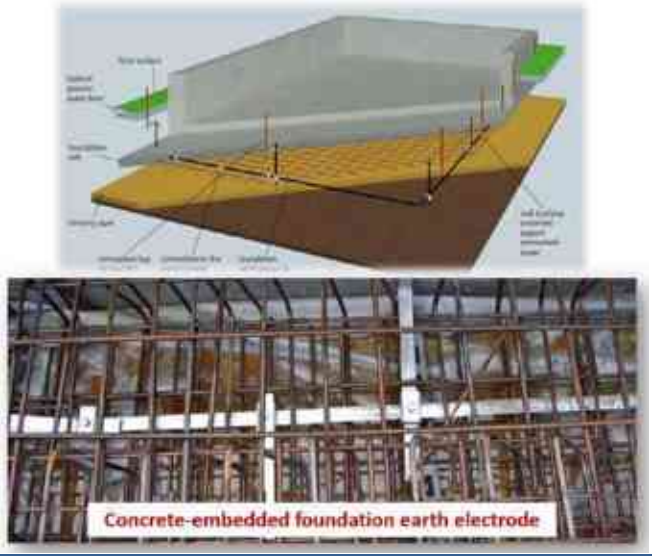
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
OPENINGS AND EMBEDDED CONDUITS AND PIPES IN STRUCTURAL MEMBERS **SBC 1101 SECTION 7A8**	**Conduit or pipe passing through a beam, or joist** A conduit or pipe passing through a beam, or joist shall **not** be: **1.** larger in **outside diameter than h/3** when passing **horizontally**, **2.** nor greater **than b_w/3** when passing **vertically.** Conduits or pipes shall be located in plan: 1. no closer to the support face **than 1/4**, or 2. farther away than **1/3** from the support face. **(see Figure 7A-24).** Conduits and pipes passing **horizontally** through the member shall be located in the **middle third** oft member **height**. Conduits and pipes **passing vertically** -through the member shall be located in the **middle third** of the member **width**. Pipes and conduits shall be spaced horizontally at least three diameters center-to- center. **(see Figure 7A-24).** Reinforcing bars shall **not** be allowed to be **cut or damaged** due to pipe penetrations at any location **unless** approved by the **licensed design professional.**	• Are conduits or pipes passing through a beam, or joist comply with **Figure 7A-24**? • Are conduits or pipes passing **vertically** through a beam, or joist is less than one-third the beam/joist width? and in the middle-third? • Are reinforcing bars cut or damaged due to pipe penetrations at any location? (unless approved by the **licensed design professional**)	 (Copy from SBC 1101, page 764)   **licensed design professional** is an individual who is: 1. **licensed** to **practice structural design** as defined by the statutory requirements of the professional licensing laws of the country or jurisdiction in which the project is to be constructed, 2. in responsible charge of the structural design.

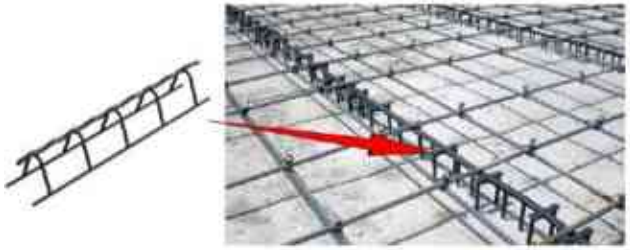
Beam width (b_w) in mm	200	250	300
Max. allowable pipe diameter passing vertically through a beam in inches (b_w/3)	$2\frac{1}{2}$"	$3\frac{1}{4}$"	4"

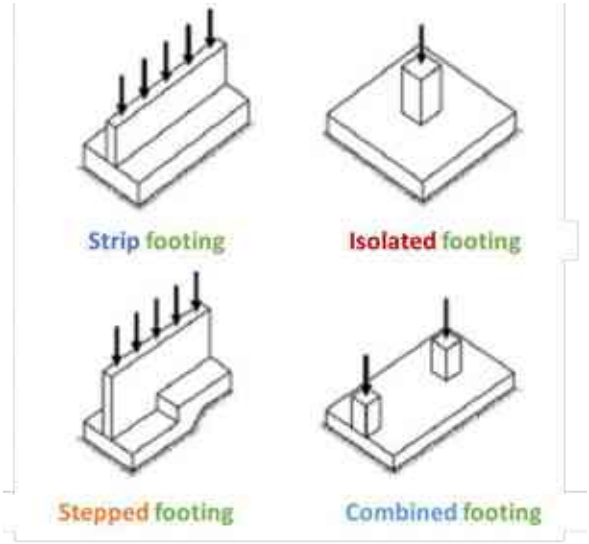
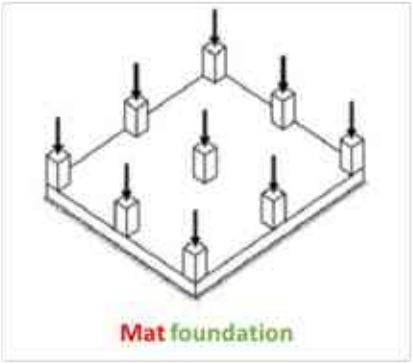
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Plumbing installation in floor (slabs)		
	Plumbing installation within the **floor areas** shall be accommodated by **either** of the following **(a) and (b):** **(a) Sunk slabs**: Sunk slabs are slabs which are cast a certain depth (**200 mm, 300 mm** or any other depending on design) below normal floor level. This **extra depth** is used for placing **pipes and utility ducts**. And then the space is filled with sand or other lightweight materials until the normal floor level. **(b) Embedded in slabs:** Designing the piping paths within the slab normal depth of the slab system. **Conduits and pipes embedded in slabs:** Conduits and pipes embedded within **solid slabs** shall be: **1.** Placed between **top and bottom reinforcement.** 2. Their outside diameter shall not be greater than **50 mm (2 inches) or 25 percent of the slab** thickness. 3. Spaced **no** less than **three diameters** center-to-center. **Pipes embedded in the top slab in joists:** Where conduits or pipes are embedded within the **top slab** in one-way joists, **depth** of the **top slab** shall be**:** • at least **25 mm greater** than the total **overall height** of the conduits or **pipes**,	• Are Plumbing installation within the floor areas shall be accommodated by either of the following: ○ Sunk slabs? ○ Embedded in slabs? • Is the concrete cover maintained as per the licensed design professional requirements? • Are conduits and pipes embedded in slabs meet the code requirements?	 Sunk slabs are generally made in bathrooms, washrooms, and wash areas where water and sewage pipes are to be taken out and the depth between the normal floor level and floor level of sunk slab is where these pipes are placed.  One-way joists slab

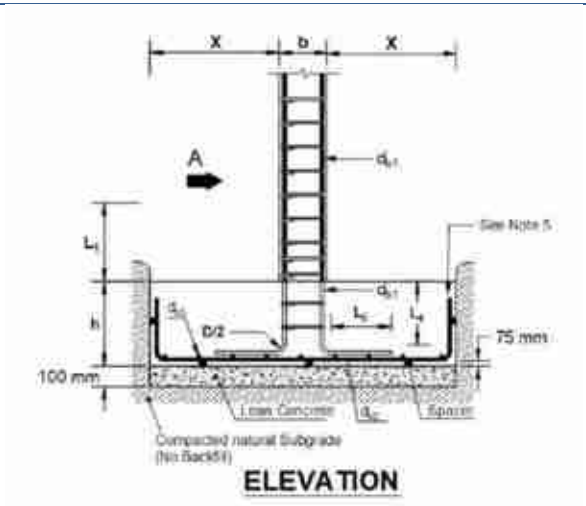
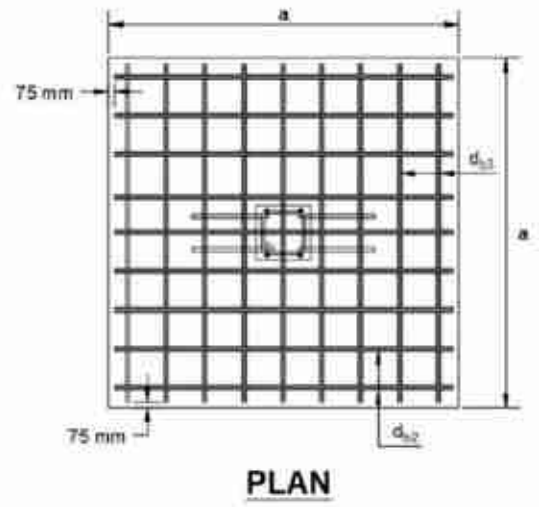
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• the **concrete cover** at any point shall not be less than **13 mm**.		
	Conduit or pipe passing through a column		
	Conduits and pipes of **any** material **shall not be embedded** within a column.	• Are there any conduits and pipes of any material embedded within a column?	 *Pipes of any material shall not be embedded within a column*
DESIGN LIMITS **SBC 1101** **SECTION 604** **SECTION 608**	**Columns dimensional limits:** **(1) rectangular columns:** Cross-sectional dimensions for rectangular columns shall comply with (a) and (b): (a) The **least** cross-sectional dimension shall not be less than **200 mm**. (b) **Ratio** of the long cross-sectional dimension to the short dimension shall **not exceed 3**. **(2) Circular columns:** Columns with a circular cross section shall have a diameter of **at least 300 mm**. **longitudinal reinforcement for columns:** Minimum diameter of **longitudinal** bars in **columns** shall be **14 mm**.	• Is the width of the rectangular columns less than 200 mm? • Is the ratio of the long cross-sectional dimension to the short dimension of rectangular columns more than 3? • Is the diameter of the circular columns less than 300 mm? • Is the diameter of longitudinal reinforcement for columns less than 14 mm? • Is the Minimum number of longitudinal bars comply with the code requirements?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Minimum **number** of longitudinal bars shall be: (a) **Three** within **triangular** ties (b) **Four** within rectangular or circular ties (c) **Six** enclosed by **spirals** • At least four longitudinal bars are required when bars are enclosed by rectangular or circular ties. • For other tie shapes, one bar should be provided at each apex or corner and proper transverse reinforcement provided. • For example, tied triangular columns require at least three longitudinal bars, with one at each apex of the triangular ties. For bars enclosed by spirals, at least six bars are required.		 (Copy from SBC 1101, page 575- Modified)  Column ties in column-beam joints (Copy from SBC 1101, page 578)

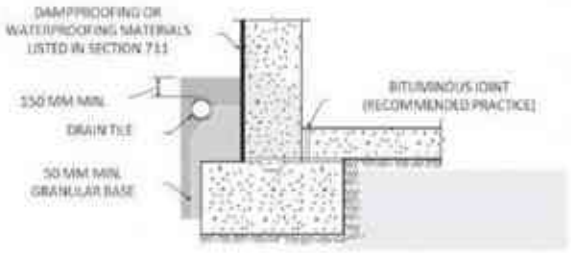
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Lightning protection system **SBC 1102 Section 36-3**	**Concrete-embedded foundation earth electrode:** If a **lightning** protection system **is required**, **IEC 62305-3** apply. The following are examples of earth electrodes which may be used: • Concrete-embedded foundation earth electrode. (for more information see Annex C.36-3of SBC 1102). • Soil-embedded foundation earth electrode. • Metallic electrode embedded directly in soil vertically or horizontally (e.g. rods, wires, tapes, pipes or plate. • Metal sheath and other metal coverings of cables according to local conditions or requirements welded metal reinforcement of concrete (except pre-stressed concrete) embedded in the ground	• Is lightning protection system required? • What is the electrode type used? • Is lightning protection system comply with IEC 62305-3?	
Slabs-On-Ground **SBC 1101 Section 712**	**Design limits** • The **minimum** slab-on-ground **thickness** shall be **100 mm.** **Contraction joints:** • **Contraction joints** shall be used to provide **uniform cracking** as the slab-on-ground shortens due to shrinkage and temperature variations. They shall be either: ○ Sawed or ○ Hand-formed and ○ Extend at least **one-fourth** the slab **thickness**.	• Is the slab-on-ground thickness less than 100 mm? • Are contraction joints used? • Are contraction joints spacing per the code requirements?	

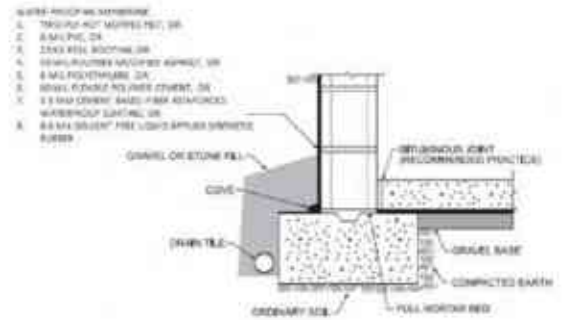
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• Contraction joints **spacing** in both directions shall be **from 2 to 6 m**. Reinforcement, if needed, shall be continuous across the joint. • No panel shall **be larger than 30 m²** or have the **long side exceed** the short side by **more than 25 percent**.		
	Reinforcement detailing		
	• Reinforcement shall be placed approximately at **one-third the slab thickness** measured from the upper surface, complying **with concrete cover requirements.** • All reinforcement for slap-on-ground **shall be supported** by **bolsters** at close enough centers to prevent **deformation by workers or equipment.** When **reinforcement** is provided, common practice is to use **welded wire fabric**. The welded wire fabric frequently is left on the ground during the pour and not picked up. When lifted up by construction personnel, it is often not in a proper or consistent location, with some on the ground and some near the top of the slab. If the reinforcement is installed, it must be properly located in the slab, or its benefit is lost.	• Is reinforcement placed approximately at one-third the slab thickness measured from the upper surface? • Does the concrete cover comply with requirements? • Are all reinforcement for slap-on-ground supported by bolsters?	 Slab bolsters 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Foundation system **SBC 1101** **Section 702** **Section 707**	**Foundation systems for residential buildings** • Foundation systems consists of two interdependent components: 1) The foundation structure itself and 2) The supporting soil. • Reinforced concrete shallow foundations are: (a) Strip footings (b) Isolated column footings (c) Combined footings (d) Mat foundations • Overall depth of foundation shall be selected such that the **effective depth** of bottom reinforcement is **at least 300 mm.** • Foundations shall not be **supported** on **compacted fill materials**.	• Is the effective depth of bottom reinforcement less than 300 mm? • Are foundations supported on compacted fill materials?	  Types of foundations (Copy from SBC 1101, page 714)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Isolated footings Dimensional limits		
	○ Spread footings shall be **square** or **rectangular** in plan. ○ Spread footings shall have the **column** or **wall** located at **the centroid** of the footing area. This shall be waived if induced moments and additional soil pressure meet the limits in 707.4 of SBC 1101. ○ **Minimum vertical distance** from the existing ground surface to footing bottom (footing- soil interface) shall be **one meter**. ○ Minimum footing **dimension** in plan shall be **one meter**. ○ Footing **depth** above bottom **reinforcement** shall **not be less than 300 mm.** ○ **Reinforcement** shall be provided in the **lower part of spread footings** in **both directions.** ○ Reinforcement shall be located **as close to footing bottom** as practicable following the concrete cover requirements. ○ In rectangular column footings, reinforcement **parallel to the shorter** side shall be located **above** reinforcement **parallel to the longer side**. ○ In spread footings, reinforcement shall **be spaced** no farther **apart than 200 mm.**	• Are spread footings shapes square or rectangular in plan? • Are the column or wall located at the centroid of the spread footings? • Is the minimum vertical distance from footing- soil interface less than one meter? • Is the minimum footing dimension in plan less than one meter? • Is the footing depth above bottom reinforcement less than 300 mm? • Are the spread footings reinforcement provided in the lower part in both directions? • Are the concrete cover requirements met? • Are the long reinforcement bars located below the short reinforcement bars? • Is reinforcement spaced no farther apart than 200 mm?	  (Copy from SBC 1101, page 723)

8.3 WATERPROOFING: Sealing: Foundation

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Foundation waterproof and dampproof **SBC 1101 Section 711 Section 712**	**Concrete foundation damp-proofing**		
	Foundation walls: Foundation walls that: 1) Retain earth and 2) Enclose interior spaces and 3) Floors below grade shall be **dampproofed** from **the higher** of (a) The top of the footing or (b) 150 mm below the top of the basement floor, to the finished grade. **Masonry walls:** • Masonry walls shall have not less than **10 mm**, Portland cement **parging** applied to the exterior of the wall. • The **parging** shall be **dampproofed** in accordance with one of the following: a) Bituminous coating. b) 1.63 kg/m² of acrylic modified cement. c) 3 mm coat of surface-bonding cement complying with ASTM C887. d) Any material permitted for waterproofing. e) Other approved methods or materials. **Concrete walls:** Concrete walls shall be **damp-proofed** by applying any one of the listed damp-proofing materials or any one of the waterproofing materials to the exterior of the wall.	• Do foundation walls need to be dampproofed? • Is foundation walls dampproofed as per the code requirements? • Is masonry walls dampproofed as per the code requirements? • Is concrete walls dampproofed as per the code requirements?	To minimize moisture in the form of **water vapor** from entering below-ground spaces from the outside, damp-proofing of the exterior foundation walls is necessary, unless **waterproofing** is required Although the terms "waterproofing" and "damp-proofing" both relate to moisture protection, they are sometimes misapplied in the sense that "waterproofing" is used when "damp-proofing" is really meant. Damp-proofing **does not give the same degree** of moisture protection as does **waterproofing**. Damp-proofing installations generally consist of the application of one or more coatings of impervious compounds that are intended to prevent the passage of water **vapor** through walls or other building elements. Damp-proofing may also restrict the **flow of water under slight pressure**.  Damp-proofing of concrete foundation wall (Copy from SBC 1101, page 731)

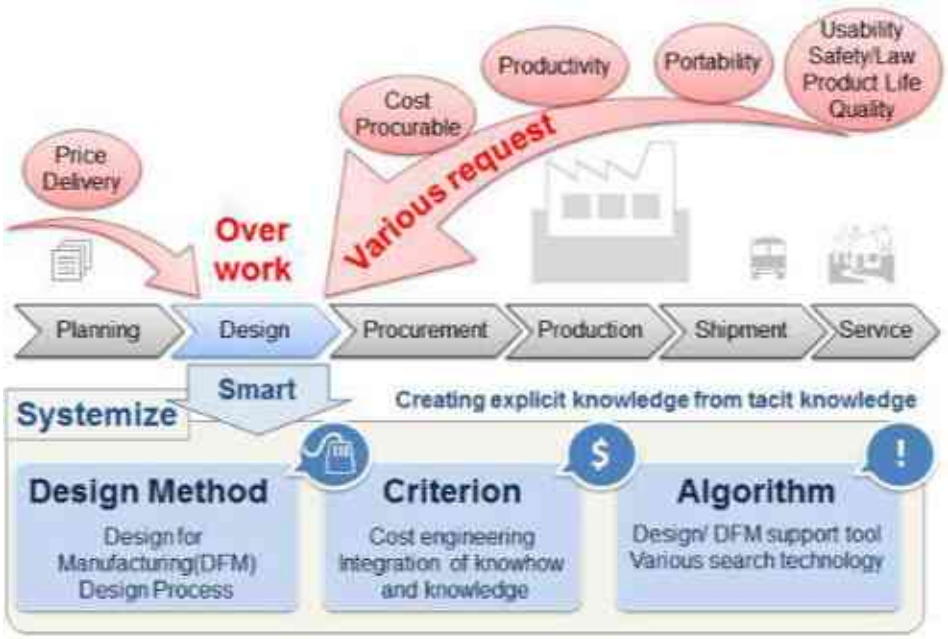
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Concrete foundation waterproofing		
	In areas where: 1) A high-water table or 2) Other severe soil-water conditions **are known to exist**, exterior foundation walls that: • retain earth and • enclose interior spaces and • floors below grade shall be **waterproofed** from the **higher of**: (a) the top of the footing or (b) 150 mm below the top of the basement floor, to the finished grade. Walls shall be **waterproofed** in accordance **with one** of the following: (a) Two-ply hot-mopped felts. (b) 25 kg roll roofing. (c) 0.15 mm polyvinyl chloride. (d) 0.15 mm polyethylene. (e) 1.0 mm polymer-modified asphalt. (f) 1.5 mm flexible polymer cement. (g) 3.0 mm cement-based, fiber-reinforced, waterproof-coating. (h) 1.5 mm solvent-free liquid-applied synthetic rubber. **All joints** in membrane **waterproofing** shall be **lapped** and **sealed** with an adhesive compatible with the membrane.	• Do foundation walls need to be waterproofed? • Are foundation walls waterproofed as per the code requirements? • Are all joints in the membrane waterproofing lapped and sealed with an adhesive compatible with the membrane?	Foundation walls that retain earth and enclose interior spaces and floors and extend **below ground water level** (seasonal or otherwise) require a **positive means** of preventing moisture migration. **Waterproofing** installations consist of the application of **a combination of**: • sealing materials and • impervious coatings used on walls or other building elements to prevent the passage of moisture **in either a vapor or liquid** form under conditions of significant **hydrostatic pressure.**  Methods of Water-proofing of basement wall (Copy from SBC 1101, page 731)
	Slabs-on-ground damp-proofing		
	A 150 µm polyethylene or approved vapor retarder with joints lapped not less than 150 mm shall be placed between the concrete floor slab and the base course or the prepared sub-grade where no base course exists.	• Is an approved vapor retarder placed between the concrete floor slab and the base course or the prepared sub-grade? • Are the approved vapor retarder joints lapped not less than 150 mm?	Many of the **moisture** problems associated with enclosed slabs-on-ground **can be minimized** by installing a **vapor retarder**. Vapor retarders of either single- or multiple- layer membranes should be acceptable if the vapor retarder is professionally installed with **lapped** joints and the barrier is **not punctured during construction.**

Introduction of new Technology

Philosophy: The intention behind using new technology is to decrease duration of construction due to Use of prefabricated elements or easier handable materials and in parallel to increase quality of construction to due avoidance of defects of on-site activities.

Considerable Technology at present :

- Precast
- Modular Systems / LGS
- AAC
- others (Tunnelform)



Top Priority Concerns :

- Design adjustment
- Flow of approval
- Work Preparation
    - Time Schedule
    - Documents
        - Shopdrawings
        - Method Statements
    - Logistics
    - Equipment
- QA/QC

Shareholder:

- Design Consultant
- Structural Engineer
- Client
- Technology Provider
- Construction Company
- Inspector

Duties and Responsibilities:

Best to be described in a responsibility Matrix:

- Who is responsible for the coordination of information?
- Who has design responsibility?
- Who is responsible for the Construction Methodology?
- Who is approving any potential adjustment of design?

- Design Consultant
  responsible for functionality and estethics. To be involved in any architectural variation or missing information

- Structural Engineer
  responsible for the construction calculation and structural system, any load bearing element and the related dimensions, e.g
  Thickness of walls, slabs, beams …
  content of rebars
  execution of connections and joints

- **Client**
  to be informed of any variation in respect of result, execution or cost
  point of final approval

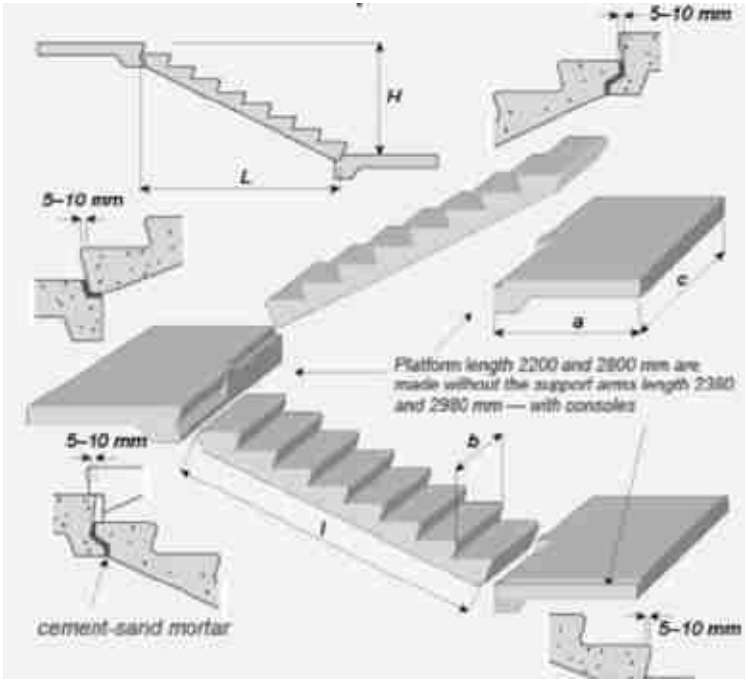
- **Technology Provider**
  responsible for transition process of traditional design (execution on site based) to use of precast elements.
  Focus is drawn on adjusted:

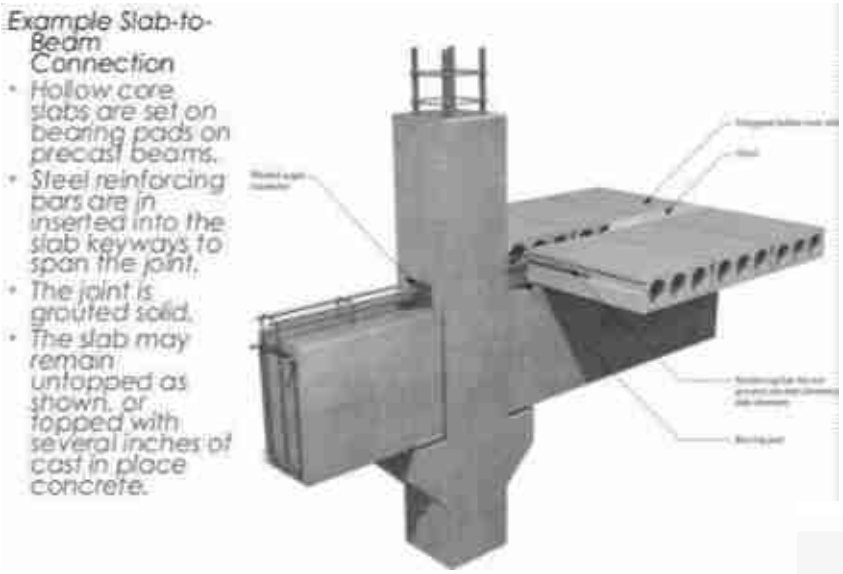
  dimensions of specific elements (walls, beams, slabs)
  preparatory requirements (adjusted starter bars, pockets, dowels …)
  adjusted connection details (grout, connectors …)
  documentation (list of elements, specific description, Weight …)

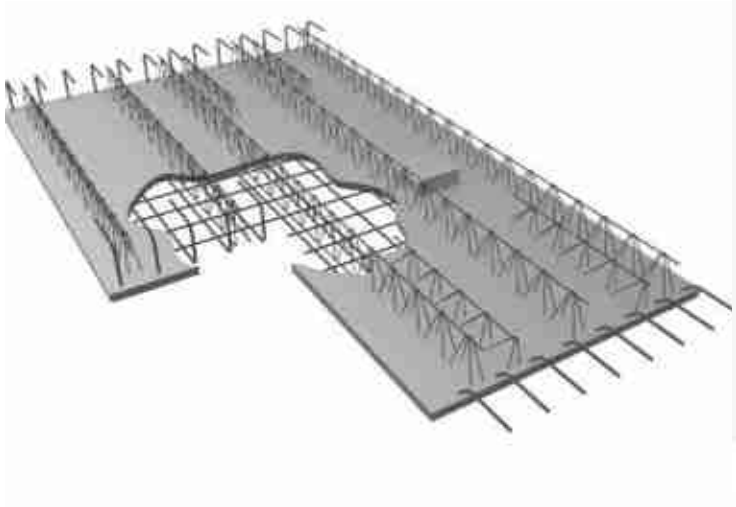
- **Construction Company**
  Communicate anticipated Construction Methodolody and initialize related adjustment process
  Crosscheck potential impact on unchanged design
  perfom adjusted work preparation and produce and provide informations such as
    - **Site Installation drawings**
    - **logistic concept**
    - **Lifting plan**
    - **laydown area**
    - **Installation Manual**
    - **HSE Plan**
    - **Quality Control Manual**

- **Inspector**
  to know shareholders involvement and crosscheck each one deliverables for quality purpose.
  Main Focus is drawn on correct execution, compared with design.

Precast =
Prefabricated concrete, casted as modular systems or specific elements, delivered to site, ready for Installation and Fixing




Example Slab-to-Beam Connection
• Hollow core slabs are set on bearing pads on precast beams.
• Steel reinforcing bars are in inserted into the slab keyways to span the joint.
• The joint is grouted solid.
• The slab may remain untopped as shown, or topped with several inches of cast in place concrete.



available elements:

1. **complete precast solution – solid structure**
2. **Hollow core Slabs**
3. **Tee Slabs**
4. **Internal and external walls**
5. **Thermal Insulated panels (sandwich)**
6. **Claddings & Parapets**
7. **Decorative precast**
8. **Boundary walls**
9. **Special Products architectural**
10. **Special Products structural**
11. **GFRC & GRG**

Yellow marked elements are typically applicable for residential housing execution

Procedures and preconditions :

- Introduction Technology

  refer to manufacturers manual. Elements are costummmade for specific use. Repitition results in safing of cost (molds can be re-used)
  Concrete quality in line with design – to be checked
  Openings to be crosschecked : shopdrawings compared with basic design

- Combination Options / Selection

  to be coordinated with structural consultant is respect of load transfer, requirement of adjusted beams or supporting structures
  Attention has to be drawn on mixed systems, a combination of precast and traditional construction is respect of move-and settlements.

- Factory Acceptance Test to assure Production Quality

  Crosscheck is advised in order to assure quality of delivered elements as well as request of documentation
  Quality Policy (ISO)
  HSE Policy
  governmental Approvals and Pre-qualifications
  Memberships and Registrations

- Site Acceptance Test to assure Installation Quality and Safety (Site Installation and work preparation)
- Review of Documents : design development and work flow of information
- Review of work flow : approval procedure for design conversion and shopdrawings
- Control of Supply Chain (Production, Delivery, Storage and Installation)
- Schedule
- Installation Execution / Workmanship
- Report
- HSE

POTENTIAL DEFECTS:

wrong concrete quality
wrong fabrication (geometry)
wrong storage
spalling

wrong placement
wrong allignment
insufficient grout
wrong or missing built in parts

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Checklist :

Checklist - Conrete Precast Installation	yes	no	
System :			
Full Precast System ? (precast only)			apply this checklist only
Mixed System (on site in situ AND Precast)			please check additional handbook chapter
Dokumentation :			
layout design			if no, no architectural compliance can be checked
Concept Report			if no, no architectural compliance can be checked
Calculation			if no, no structural compliance can be checked
Specification			if no, no material compliance can be checked
Architectural Drawings			if no, no architectural compliance can be checked
Structural Drawings			if no, no structural compliance can be checked
MEP Drawings			if no, no installation compliance can be checked
Factory Acceptance Cetrificate			
Shop Drawings			if no, no pre installation check is possible
Calculation Precast			no reinforcement concept check is possible
Installation Manual			no correct installation execution can be assured
Delivery Schedule			no Planning possible
On site Conditions			
Laydown area available			indication for professional handling and competence
Lifting Equipment available			indication for professional handling and competence
Check pre-installation :			
Shopdrawings compliant with architectural drawings ?			"no" leads to rejection of inspection and installation approval
Elements size as per shopdrawings ?			"no" leads to rejection of inspection and installation approval
Embedded Items installed correctly			"no" leads to rejection of inspection and installation approval
Connection Parts and Details available			"no" leads to rejection of inspection and installation approval
Element free of damages and cracks			"no" leads to rejection of inspection and installation approval
Check post-installation :			
Damages due to installation			rectification required and re inspect
correct alignment vertical			rectification required and re inspect
correct alignment horizontal			rectification required and re inspect
fixed correctly (by grout or mechanical)			rectification required and re inspect
openings for lifting hooks sealed correctly ?			rectification required and re inspect

Connection / Joints?

Planning?

Alignment?

Element?

LGS =
Light Gauge Steel framing system, used modular or installed on site, insulated and covered with Gipsum Board various layer or filled with concrete

Implementation Proposal - LGS

Impressions :

available elements

12. Vertical Panels (with or wothout floor / roof frame)

Proposal for consideration within the Handbook for Housing Purpose: Nr. 1 to 5, 6 & 9

Procedures and preconditions :

- Introduction Technology

internal separation realized with supportive steel profiles mounted on slabs, combined to a load carrying structure, insulated and cobered with gypsum sheets, one or two layers.
Can also be applied as modular system.

Non-autoclaved lightweight aerated concrete can be used as an infill for drywalls instead of glass wool and rock wool.
Four hours fire-rating for 100 mm thickness could be realized. Light gauge steel for framing, fiber cement boards for cladding, cellular lightweight concrete for filling.
Drywall partitions with the lightweight aerated concrete infill will provide good thermal and sound insulation.

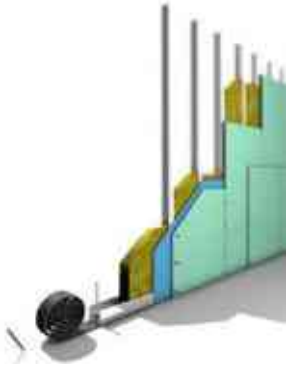
- Combination Options / Selection

Movement has to be allowed for within the construction. Please crosscheck top sided connection detail to roof slab

- Factory Acceptance Test to assure Production Quality (optional – in case of modular fabrication)
- Review of Documents : design development and work flow of information

  Interface with MEP, installation to be crosschecked and required load transfer

- Review of work flow : approval procedure for design conversion and shopdrawings
- Control of Supply Chain (Production (optional), Delivery, Storage and Installation)



Compatibility of construction material to be crosschecked, e.g. use in wet areas (board and insulation)

- Installation Execution / Workmanship

crosscheck alignment. It is advised to request marking on floor slab

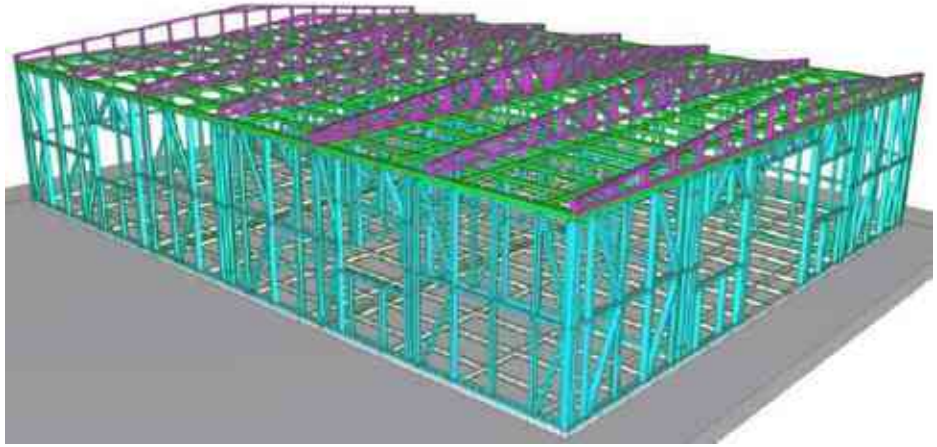
- Report
- HSE

POTENTIAL DEFECTS:

wrong construction methodology (vapor permeable – steam tight)
wrong connection detail – expansion joint
wrong Insulation or filling Material
missing moisture protection

wrong allignment
lack of stiffening
single board – double board application? (acoustics)

insufficient plaster
cracks at joints



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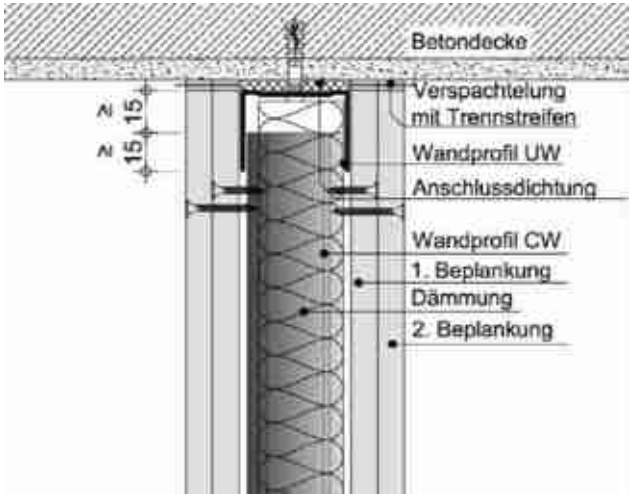
wrong or missing built in parts

mould
Checklist:

Checklist - Light Gauge Steel	yes	no	
System :			
load bearing ?			check structural concept
substitute of basic design ?			please check transformation documents
modular ?			if yes - follow checklist as per precast
Dokumentation :			
layout design			if no, no architectural compliance can be checked
Concept Report			if no, no architectural compliance can be checked
Calculation			if no, no structural compliance can be checked, akkustics, insulation
Specification			if no, no material compliance can be checked
Architectural Drawings			if no, no architectural compliance can be checked
Structural Drawings			if no, no structural compliance can be checked
MEP Drawings			if no, no installation compliance can be checked
Shop Drawings			if no, no pre installation check is possible
Installation Manual			no correct installation execution or components can be assured
On site Conditions			
Laydown area available (moisture protection !)			indication for professional handling and competence
Check installation stage 1 :			
Shopdrawings compliant with architectural drawings ?			"no" leads to rejection of inspection and installation approval
Elements size as per shopdrawings ?			"no" leads to rejection of inspection and installation approval
Frame location installed correctly ?			"no" leads to rejection of inspection and installation approval
Embedded Items installed correctly			"no" leads to rejection of inspection and installation approval
Top connection allows movement ?			"no" leads to rejection of inspection and installation approval
Insulation correct material ?			"no" leads to rejection of inspection and installation approval
Insulation correct material ?			if "no" check construction : wool or light concrete
Connection Parts and Details available			"no" leads to rejection of inspection and installation approval
panels free of damages			"no" leads to rejection of inspection and installation approval
Check installation stage 1 :			
Costruction properly closed by gypsum boards ?			rectification required and re inspect
Costruction properly closed by gypsum boards ?			rectification required and re inspect
correct alignment vertical			rectification required and re inspect
correct alignment horizontal			rectification required and re inspect
layer of boards compliant to design ?			rectification required and re inspect
Sealing applied smoothly ?			rectification required and re inspect
Moisture Protection applied			rectification required and re inspect

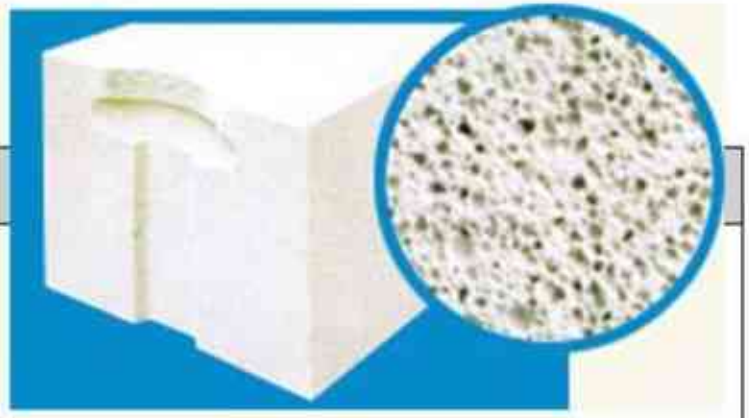

Betondecke
≥ 15
≥ 15
Verspachtelung
mit Trennstreifen
Wandprofil UW
Anschlussdichtung
Wandprofil CW
1. Beplankung
Dämmung
2. Beplankung

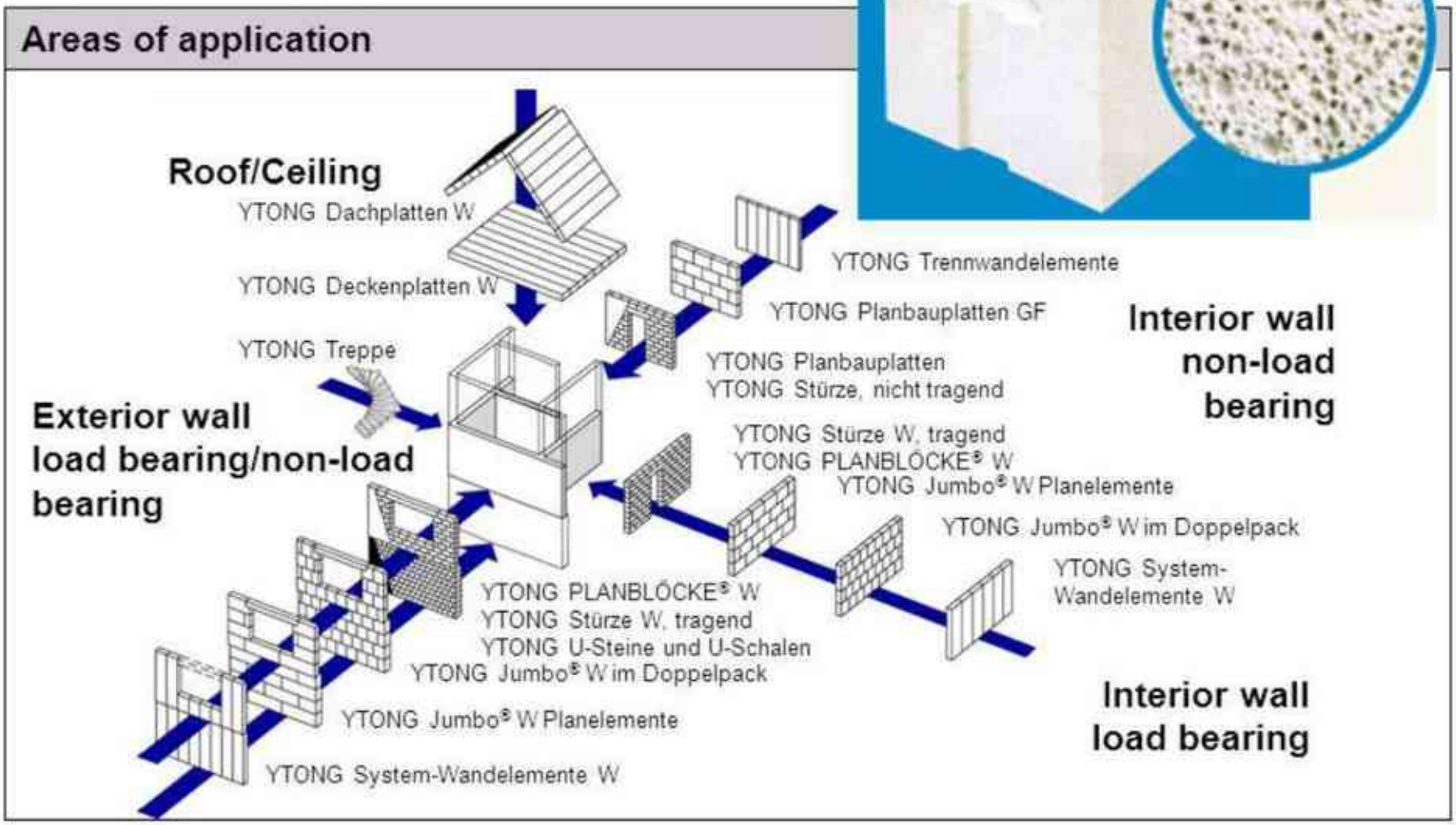
AAC =

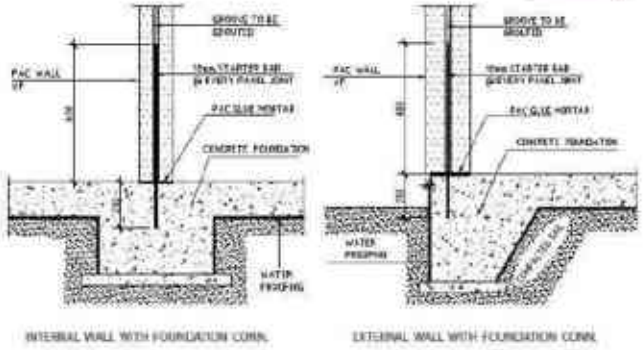
Autoclaved Aerated Concrete, fabricated under pressure with a high ratio of air in order to receive a light block with various dimensions, easy to install and handle, with very high values for insulation.

Supplier exemplaric only – sme applies for any manufacturer

Autoclaved Aerated Concrete






INTERNAL WALL WITH FOUNDATION CORN
EXTERNAL WALL WITH FOUNDATION CORN

available elements reinforced:

13. Vertical Panels
14. Horizontal Panels
15. Roof and Floor Slabs
16. Wall lintel panels
17. Box Lintel panels

available elements Non-reinforced:

18. Standard blocks
19. Jumbo blocks
20. Hordi blocks
21. Roof Tiles

Specifications

Type - Aerated Autoclaved Concrete Block Unit	Value	Property
kg/M³	500-550	Density(oven dry)
N/mm2	>4	Compressive Strength*
W/M deg.k	0.142	Thermal Conductivity(K Value)
hr	4-6	Resistant to Fire*
%	0.02	Drying Shrinkage
db	37-42	Sound Reduction
Kg	13-14	Weight (20x20x600 mm)

Yellow marked products are suitable for residential housing construction

Procedures and preconditions :

- Introduction Technology

  Autoclaved Airated Concrete : fine aggregates, cement, fly ash (opt), expansion agent (such as Al powder at 5 to 8 %by Volume) for Production – refer to Manufacturer Profile

- Combination Options / Selection
- Factory Acceptance Test to assure Production Quality (optional)
- Site Acceptance Test to assure Installation Quality and Safety (Site Installation and work preparation)
- Review of Documents : design development and work flow of information
- Review of work flow : approval procedure for design conversion and shopdrawings
- Control of Supply Chain (Production (optional), Delivery, Storage and Installation)
- Installation Execution / Workmanship
- Report
- HSE

فحص
جودة البناء

POTENTIAL DEFECTS:

wrong handlig of blocks leading to spallings
wrong alignment layer of mortar
missing water stop layer
wrong “glue”
wrong allignment

wrong or missing built in parts

PRODUCTS

YTONG blocks

B 2,0 / D 350 YTONG extrA⁺ — For non- load bearing walls of low energy and passive buildings;
Strenght class 2,0 MPa; Density class 350 kg/m³
Thermal conductivity $\lambda_{10\,dry}$ = **0,09 W/mK**

B 2,5 / D 390 YTONG A⁺ — For non- load bearing walls of energy efficiency buildings;
Strength class 2,5 MPa; Density class 390 kg/m³
Thermal conductivity $\lambda_{10\,dry}$ = **0,11 W/mK**

B 2,5 / D 440 — For non- load bearing walls;
Strength class 2,5 MPa; Density class 440 kg/m³
Thermal conductivity $\lambda_{10\,dry}$ = **0,12 W/mK**

B 5,0 / D 600 — for load bearing walls and **bricked earthquake-resistant gaskets**;
Strength class 5,0 MPa; Density class 600 kg/m³
Thermal conductivity $\lambda_{10\,dry}$ = **0,16 W/mK**

B 5,0 / D 700 — with increased sound insulation capacity;
Strength class 5,0 MPa; Density class 700 kg/m³
Thermal conductivity $\lambda_{10\,dry}$ = **0,18 W/mK**

YTONG blocks – N+F

YTONG blocks N+F are produced with the same thikness from **100 to 350 mm** and have the same strength and density class as the smooth YTONG blocks.

They are connected on the groove and tongue-principle. Using this type of blocks one does not have to put mortar on the vertical side and thus saves time and mortar.

فحص
جودة البناء

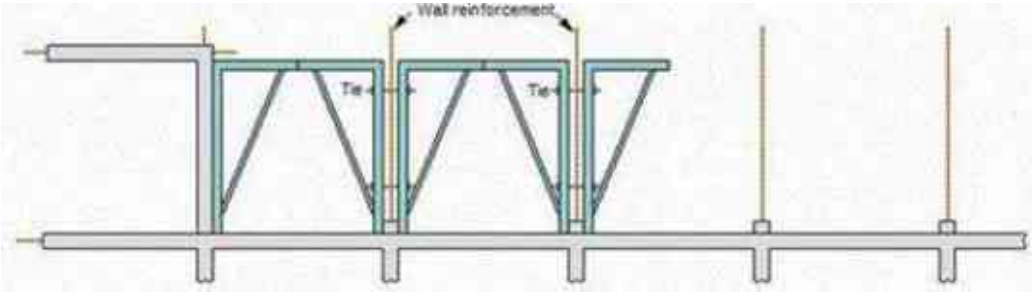
Checklist :

Checklist -autoclaved aerated concrete	yes	no	
System :			
load bearing ?			check structural concept
big size elements ?			if yes - follow checklist as per precast
Dokumentation :			
layout design			if no, no architectural compliance can be checked
Concept Report			if no, no architectural compliance can be checked
Calculation			if no, no structural compliance can be checked, akkustics, insulation
Specification			if no, no material compliance can be checked
Architectural Drawings			if no, no architectural compliance can be checked
Structural Drawings			if no, no structural compliance can be checked
MEP Drawings			if no, no installation compliance can be checked
Installation Manual			except for blocks
On site Conditions			
Laydown area			indication for professional handling and competence
			Material is very sensitive !
Check installation			
correct first layer of mortar			rectification required and re inspect
correct alignment vertical			rectification required and re inspect
correct alignment horizontal			rectification required and re inspect
waterprotection layer installed ?			rectification required and re inspect
correct top joint connection			rectification required and re inspect
Installation trenches done properly			rectification required and re inspect

Other Methodologies …

Tunnel Form

Walls and Slab are casted at once to achive a monolitic structure with stiff connections.
This structure can then carry various more storeys.
Alternatively, the dimension can be reduced and material safed.



Concrete Modular Systems

Prefabricated concrete structures are delivered to site and placed accordingly.
Can be applied for stand alone structures or funcional unites like bathroom cells

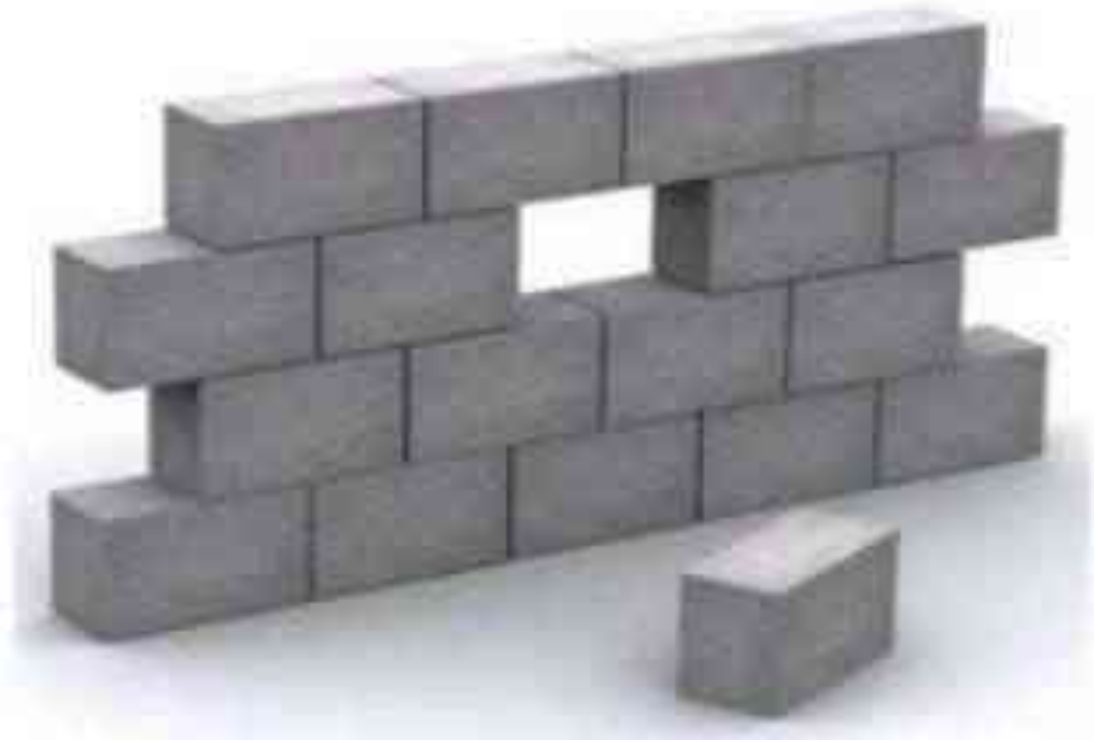
General sequence of prefabricated systems :

1. clients approach
2. conceptual design
3. detailed design & engineering
4. Production & Fabrication
5. Delivery
6. Installation
7. Insulation & Cladding
8. MEP Installation
9. Internal fit out
10. external fit out
11. Internal & external finish
12. handover

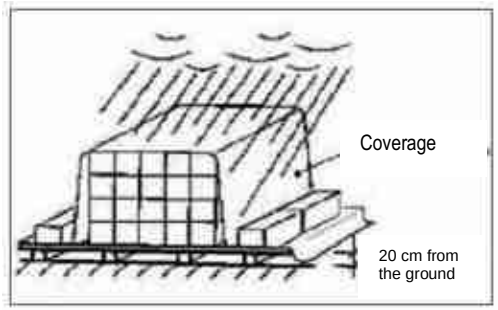
8.4 CIVIL/ STRUCTURAL WORK: Technical Craft Masonry work

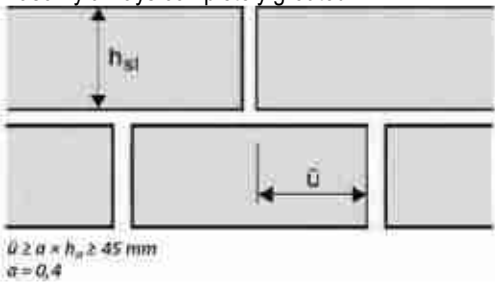
Technical Craft

Masonry



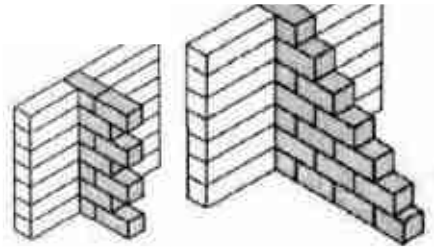
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Masonry	**General information on masonry work**			
	SBC 1101 Section 801 Section 802	- Masonry walls should carry loads and fulfil weather protection, sound insulation, fire protection and thermal insulation requirements; - The air tightness is determined in conjunction with plasters/renders, windows, external doors and ceilings; - Condition of the masonry bricks/blocks: Minimisation of the use of damaged masonry bricks (inhomogeneous masonry – risk of cracking);	- Are the load-bearing walls built in accordance with the design, are there any deviations with regard to the position in the floorplan. - Are upstand beams and beams installed if there are no walls (wall slabs/panels) under load-bearing walls on the story below (ceiling deflections); - Does the masonry comply with the structural design requirements? - Check overlap length; - Check the condition of the masonry bricks/blocks and mortar, dry? Define storage area, protect against the weather;	Question: Are several formats used? Question: Are masonry blocks that have already been installed reused Question: Are brickwork chimneys and fireplaces built within the construction area? Question: Is masonry generally designed with structural calculations or is a type of empirical masonry used?
	Design			
		The design should contain: - Brick/block formats; - Quality classes; - Type and location of the reinforcement (reinforcement plan); - Execution of the fixings / wall joints; - Dimensional information on deformation, e.g. creep and shrinkage; - Loads applied, - Size and location of pipes; - Compressive strength, outside if exemptions are possible; Masonry design at wall joints / crossing walls:	- Check delivery notes, approvals, etc. and compare with drawings;	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Shear forces and shear stresses must be absorbed by the masonry; -		
	Construction site - masonry blocks/bricks and mortar			
		Storage: - Protection from moisture and in Saudi-Arabia also against intensive sunshine; - Protection from mechanical damage;	- Check storage area;	 NO GO :   Masonry bricks/blocks and masonry protected from the weather.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Construction materials (bags of mortar) not stored on pallets or protected from the weather.
	Use/laying of masonry			
	Masonry/Walling	- Masonry must be laid in stretcher bond; - Butt and horizontal joints must be 10 mm thick (unless stated otherwise in the design); - Thickness of the bearing joint of the master layer (above floor slab / ceilings) may not be less than 6 mm and not larger than 20 mm; - Open joints at the ends of walls must be closed (filled with mortar), basis of the plasterwork; - Vertically perforated bricks must be laid so that the load bearing plane is maintained (holes vertical) and end faces fully mortared; - Ends of the vertically perforated bricks are to be laid in the correct position, the butt joint between the ends should not be thicker than the stone wall of the vertically perforated brick, - Horizontal bed joints at columns, pillars, etc. must be completely filled with mortar; - End face of open bricks must be filled with mortar (basis of the plasterwork); - The joint mortar of horizontal bed joints must be applied over the whole area to avoid voids, - Masonry should not be laid on wooden beams;	- Before building walls the evenness of the floor slab and ceilings must be checked – then decide on execution of the master layer (first course), if necessary consult structural engineer; - Check the overlap lengths (based on EN 1996-1-1);	Question: Are wall joints of vertically perforated brick masonry always completely grouted?  Overlap length at least 40% of the brick/block height, not < than 45 mm. Incorrect execution: Overlap length too small, possible cracking, especially where subjected to bending. 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Unfinished masonry (top end) must be protected from the weather; - Dry and highly absorbent masonry must be pre-wet before laying; - Lay masonry blocks/bricks aligned horizontally and vertically plumb; - use the same brick/block heights in the stretcher course, except at wall ends and lintels; - Use masonry bricks/blocks with the same strength;		  Cut vertically perforated bricks in area of ceiling support laid cross-wise.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Insulation bricks laid incorrectly, the core insulation jumps/is offset, no central load transfer possible.  Missing lintel, masonry blocks will topple over.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Masonry blocks not cut, broken out edges, which are extensively closed with mortar. Clarification: Reinforcement in masonry, if masonry not bonded, here better than 0.028 % of the wall cross-section;
		Wall joints (one of the following conditions must be fulfilled): - at least 50 % keying, i.e. every second row laid with bond; - connected with masonry anchors, cast in the wall, minimum size 6.5 x 38 x 700 mm, bent in U- or Z-shape, maximum spacing 1.20 m; Crossing walls: - Masonry anchors as above, maximum spacing 1.20 m, reinforcement at least 200mm²/ m wall height;	- Check the masonry anchors before building the connecting wall; - Check the bond;	 Making the keying.  Figure above exemplary for correctly installed masonry connectors.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Temperature	Laying masonry in cold temperatures: - Use of the provisions of ACI 530.1/ASC 6/ TMS 602, if ambient temperature is below 4°C and temperature of the masonry blocks is less than 4°C; - Masonry blocks with temperature below -7°C are not to be used; - Frozen masonry bricks/blocks or blocks with ice and snow are not to be used; - Snow and ice must be removed; - Ambient temperature from 0°C to 4°C: Do not heat water and aggregates in the mortar to above 60°C; Mortar sand and water should have temperature between 4°C and 49°C when used; Water with temp. < 0°C must be heated;	- Check outdoor temperatures and masonry and mortar, - If applicable, additional measures: Heat materials;	
		Laying in hot temperatures: - Provisions in ACI 530.1/ASC 6/ TMS 602 Article 1.8 D, if following basic conditions not correct: - if outdoor temperature > 38°C, or - if outdoor temperature > 32°C and wind speed > 13 km/h; - The temperature should be < 49°C to make the mortar, sand must be kept moist and loose; - Other special conditions: if the ambient temperature exceeds 46°C, or 40°C if the wind speed is > 13 km/H, the construction materials must be protected from direct sunshine; - During the masonry work the outdoor temperatures may not exceed 38°C or max. 32°C if wind speed > 13km/h; - Mixer, mortar containers must be rinsed with cold water; - the mortar consistency must be ensured with cold water; - the mortar must be used up within the first two hours of mixing;	- Check outdoor temperatures and masonry and mortar, - If applicable, additional measures: Cool materials, shade;	

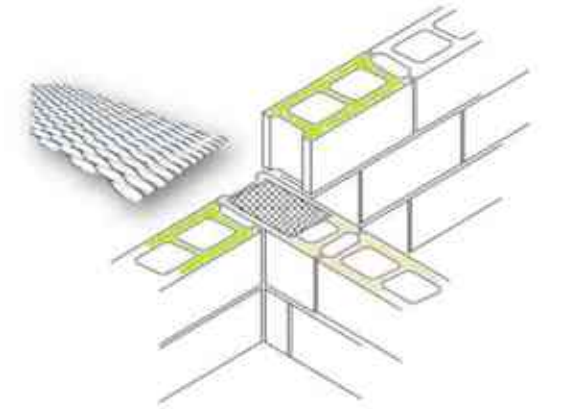
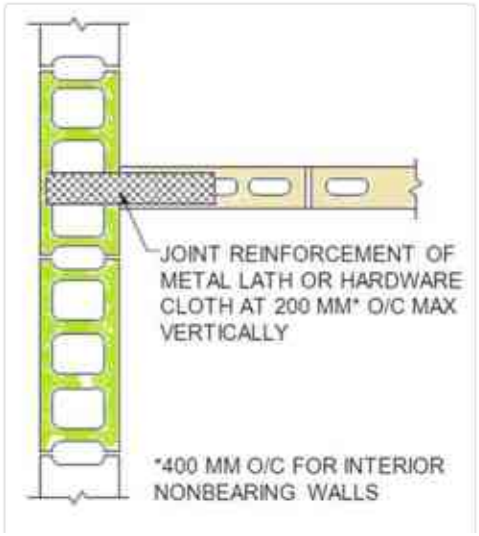
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- use of ice as mixing water is not allowed; - of the daytime temperature exceeds 38°C or 32°C at wind speed > 13 km/h the newly built masonry must be sprayed with water for 3 days, 3x a day;		
	Masonry joints / mortar	- Butt and horizontal joints must be 10 mm thick (unless stated otherwise in the design); - the ready-mix dry mortar may only be mixed with the water quantity specified by the manufacturer; - Mortar that has become stiff and can no longer be used may not be re-mixed and then applied; - Mortar joints more than approx. 5 cm wide can be filled with pieces of brick/block;		
			- Check joint thickness, joints completely filled;	 Butt joints too large and lack of mortar in the horizontal bed joint.  Joints not completely closed.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Butt joints made too wide > 10 mm. Masonry tends to crack in these areas.
	Pipes	- Loading capacity of the masonry is reduced by slots and recesses; - Recesses for pipes in structurally important masonry are not allowed; - If recesses, must be taken into account in the structural calculations, - The distance between pipes/ sockets and core of the masonry should equal 3 x the pipe diameter; - the maximum pipe cross-section in columns and pillars may not exceed max. 2% of the pillar / column cross-section; - Pipes must not be embedded in the masonry if: a) contain liquid or gas / fumes at a temperature of over 66 ° C; b) Pressure above 380 kPa; c) Contain water or other liquids, which can freeze.	- Check position of recesses against structural calculations/ shop design;	 Incorrect execution in structural beam (verification required).

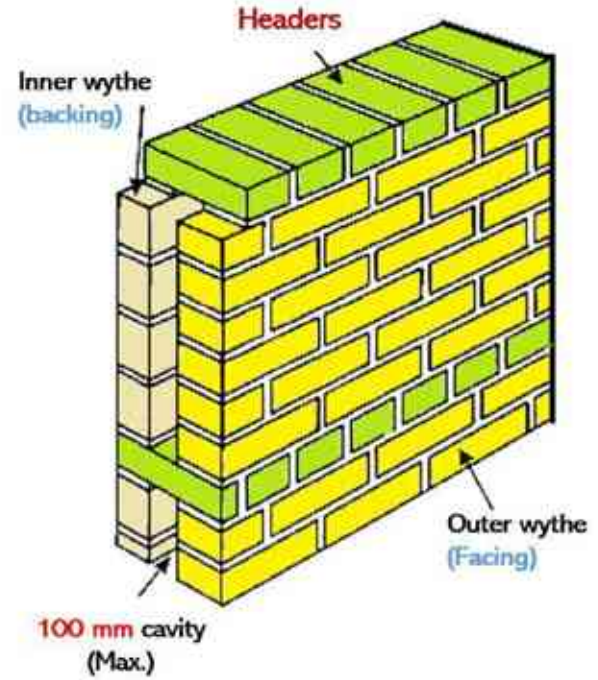
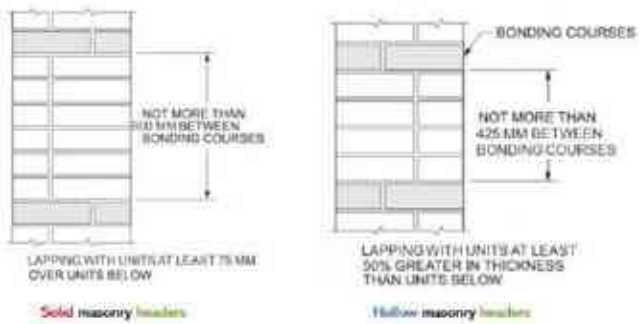
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Recess apparently made across the whole wall cross-section.
	Miscellaneous			
	SBC 1101 Section 801 Section 802	- Inspection & testing tasks / construction site inspection results from Table 2.6 - A quality assurance program must be drawn up: - corresponding to masonry in construction documents; -	- Check the approvals of the materials used, comparison for usability; - Masonry - Mortar - Jointing - If applicable, anchors - Reinforcement, lintel	

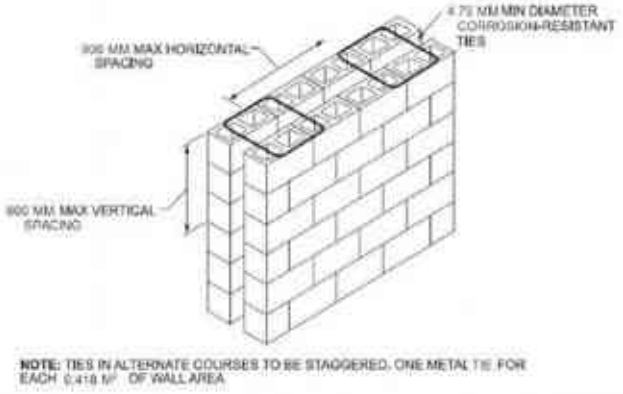
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Wall construction **SBC 1101** **Section 802**	**General Comments:** The primary concern of this chapter is the structural integrity of wall construction and transfer of all imposed loads to the supporting structure. In certain instances, a wall must have a **fire-resistance rating**. Where this is necessary, the wall system must be a tested assembly, and any conditions specific to the installation of the assembly must apply as well. Examples of these provisions include: • Common wall between townhouses • Walls separating two-family dwellings. • Exterior walls based on location on property. **Purpose** This chapter provides the requirements for the design and construction of wall systems that are capable of supporting the minimum: 1) design vertical loads (dead and live loads). 2) lateral loads (wind or seismic loads).		
	Lintels:		
	Masonry wall **openings** require a structural member designed to support the masonry above. Masonry over openings shall be supported by: • Steel lintels, • Reinforced concrete or masonry lintels or • Masonry arches designed to support load imposed. **<u>Note</u>:** **Wood** is **not permitted** for a lintel supporting a masonry wall.	• Are all masonry wall openings supported by structural member? • Is wood lintel used to support a masonry wall opening?	 

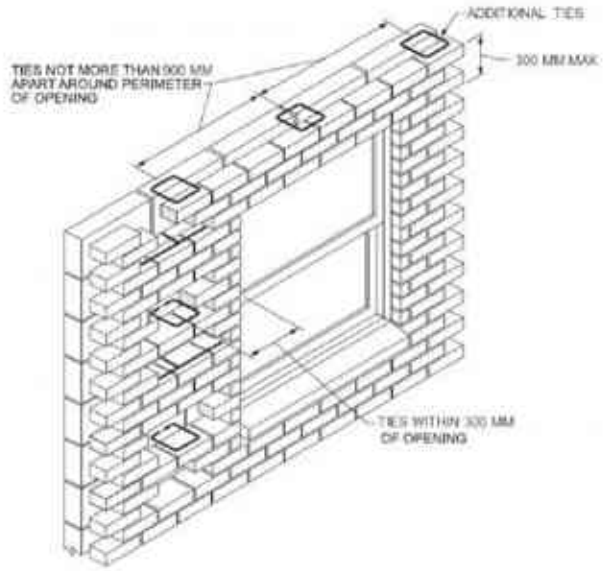
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Intersecting masonry walls:		
	(1) Interior **non-load- bearing** walls shall be anchored at their **intersections**, at vertical intervals of not more than **400 mm** with joint reinforcement of not less than 9-gage (gauge) 4 mm, or 6 mm galvanized mesh hardware cloth. **(2)** other than interior non-load-bearing walls, shall be anchored at **vertical** intervals of not more than **200 mm** with joint reinforcement of not less than 9-gage (gauge) and shall extend not less than 760 mm in each direction at the intersection **Note:** Other metal ties, joint reinforcement or anchors, if used, shall be spaced to provide equivalent area of anchorage to that required by this section.	• Are interior non-load- bearing walls anchored at their intersections, at vertical intervals of not more than 400 mm? • Are other than interior non-load-bearing walls, anchored at vertical intervals of not more than 200 mm?	 **Gauge is the measurement of the thickness, or diameter, of wire. Originally, the measurement was based on the number of times that steel would be pulled, or drawn, through a set of dies that gradually decreased in diameter**

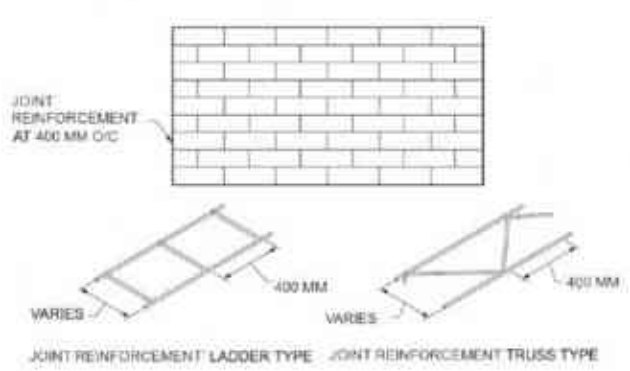
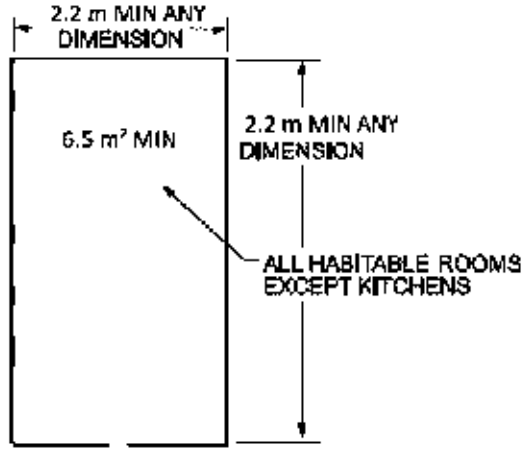
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			  (Copy SBC 1101, page 808)
	Multiple-wythe masonry:		
	In cavity walls: 1) Neither the **facing** nor the **backing** shall be less than **75 mm** nominal in thickness.	• Is the facing/backing less than 75 mm nominal in thickness?	• A multiple wythe masonry is more than one vertical section of masonry laid next to one another (facing and backing).

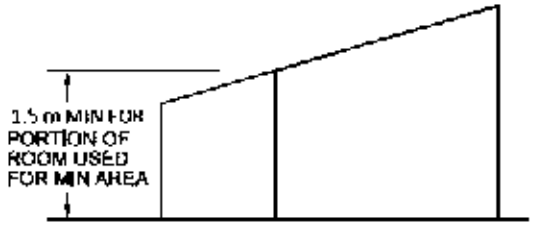
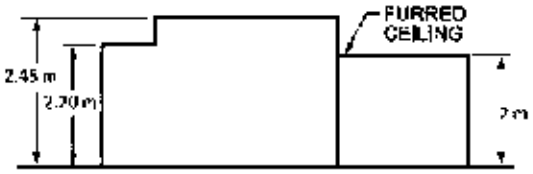
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	2) The cavity shall be **not more** than **100 mm** nominal in width. 3) The backing shall be not less than as thick as the facing. **<u>Exception</u>**: Cavities shall be permitted to exceed the 100 mm nominal dimension provided **tie size and tie spacing** have been established by **calculation**. **First: Bonding with masonry headers:** Bonding with: • Solid masonry headers or • hollow masonry headers shall comply with the following: **(1) Solid units headers:** Where the facing and backing (adjacent wythes) of **solid masonry** construction are bonded by means of **masonry headers**, not less than **4 percent of the wall surface** of each face shall be composed of headers extending not less than **75 mm into the backing.** The **distance** between adjacent full-length **headers** shall **not exceed 600 mm** either **vertically** or **horizontally**. In walls in which a single header does not extent through the wall: 1) headers from the opposite sides shall overlap not less than 75 mm, 2) or headers from opposite sides shall be covered with another header course overlapping the header below not less 75 mm.	• Is the backing less than or as thick as the facing? • Is the cavity not more than 100 mm nominal in width? • Do the facing and backing bonded by means of **masonry headers** comply with the code requirements? • Do the facing and backing bonded by means of **wall ties** comply with the code requirements? • Do the facing and backing bonded by means of **prefabricated joint reinforcement** comply with the code requirements?	• Multiple wythes are utilized in situations when added insulation, support, stability, or protection is required. • Normally multiple-wythe masonry are used to construct external walls with heat insulation in the cavity between the facing and the backing. 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	(2) Hollow units headers: Where two or more hollow units are used to make up the thickness of a wall, the stretcher courses shall be: 1) bonded at vertical intervals not exceeding 860 mm by lapping not less than 75 mm over the unit below, 2) or by lapping at vertical intervals not exceeding 430 mm with units that are not less than 50 percent thicker than the units below. **Second: Bonding with wall ties**. • Where the facing and backing (adjacent wythes) of masonry walls are bonded with **5 mm-diameter wall ties** embedded in the horizontal mortar joints, there shall be not less than **one metal tie** for each **0.42 m² of wall area**. • Ties in alternate courses shall be **staggered**. • The maximum **vertical distance** between ties shall not exceed **600 mm.** • The maximum **horizontal distance** shall not exceed **900 mm**. • Rods or ties bent to **rectangular shape** shall be used with **hollow masonry units** laid with the cells vertical. • In other walls, the **ends of ties** shall be bent to **90-degree** angles to provide **hooks** not less than **50 mm long**. • **Additional** bonding ties shall be provided at all **openings**, spaced not more than **900 mm apart** around the perimeter and within 300 mm of the opening. **Third: Bonding with prefabricated joint reinforcement:**		  (Copy SBC 1101, page 809 & 810)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Where the facing and backing (adjacent wythes) of masonry are bonded with prefabricated joint reinforcement, there shall be: 1) not less than **one cross wire** serving as a tie for each **0.25 m²** of wall area. 2) The **vertical** spacing of the joint reinforcement shall not exceed **400 mm**. 3) Cross wires on prefabricated joint reinforcement shall not be smaller than No. 9-gage (gauge). The longitudinal wires shall be embedded in the mortar.		 **Masonry Bonding with wall ties (bounding-metal ties)** (Copy SBC 1101, page 810)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 **Masonry Bonding with wall ties (around openings)** (Copy SBC 1101, page 811)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 **Masonry Bonding with Prefabricated joint reinforcement** (Copy SBC 1101, page 812)
Minimum room areas and height **SBC 1101 SECTION 304 SECTION 305**	**Minimum area:** Habitable rooms shall have: 1. A floor area of not less than **6.5 m²**. 2. Not less than 2100 mm in any horizontal dimension **Exception**: Kitchens. **Room with a sloping ceiling:** **If the height of:** 1. Portions of a room with a sloping ceiling measuring less than **1500 mm**. 2. or a furred ceiling measuring less than **2100 mm** from the finished floor to the finished ceiling shall **not** be considered as contributing to the **minimum required habitable area** for that room. **Minimum celling height:**	• Are all habitable rooms have a floor area of not less than 6.5 m²? • Are all habitable rooms have not less than 2100 mm in any horizontal dimension? • Are all habitable space, hallways and portions of basements containing habitable space and hallways have a ceiling height of not less than 2100 mm? • Are the requirements of rooms with a sloping ceiling satisfied? • Are bathrooms, toilet rooms, portions of basements that do not contain habitable space or hallways, and laundry rooms have a ceiling height of not less than 2000 mm?	**Habitable rooms** in a dwelling unit are family rooms and bedrooms used for living, sleeping, eating, or cooking. (bedrooms, living rooms, kitchen…) 

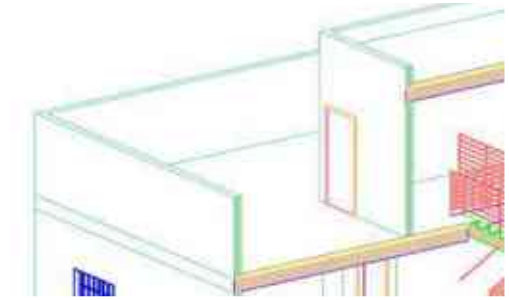
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	1. Habitable space, hallways and portions of basements containing habitable space and hallways shall have a ceiling height of not less than **2100 mm**. 2. Bathrooms, toilet rooms and laundry rooms shall have a ceiling height of not less than **2000 mm**. 3. Portions of basements that do **not** contain habitable space or hallways shall have a ceiling height of not less than **2000 mm.**		  THE SHADED PORTIONS OF EACH ROOM WOULD NOT BE CONSIDERED IN DETERMINING THE MINIMUM REQUIRED FLOOR AREA. (Copy SBC 1101, page 206)

8.5 WATERPROOFING: Sealing: roof, terrace, socket

Technical Craft

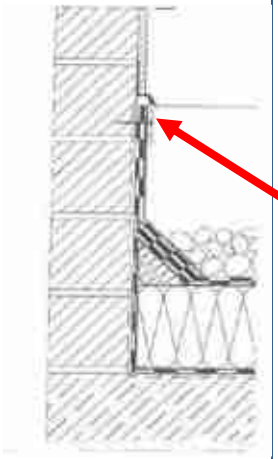
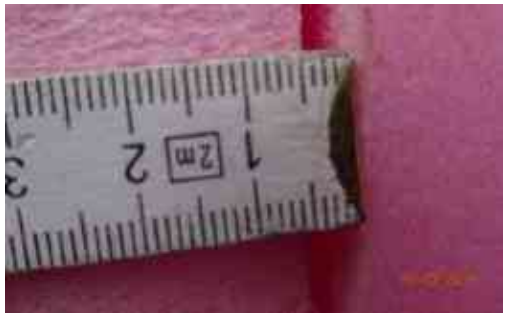
Sealing roof, terrace, socket

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Roof / waterproofing work **General:** **The roofs dealt with here are almost exclusively flat roofs made from reinforced concrete.** **Flat-sloped roofs or pitched roofs are an exception and are not covered here.**	SBC 1101 Section 905.11	With new-builds (flat roofs made from reinforced concrete): Protective goals (general - for the complete roof structure): - Sealing against moisture - Heat protection - Noise protection if required - Longevity	- Roof testing, flat roofs (waterproof layers, connection points, drainage) - Material selection for the roof sealing / Have approved systems been used? - Insulating layer - Bitumen sheeting / vapour barriers - Thermal insulation - Roof-sealing sheeting - Protection against wind suction required? - UV compatibility - Suitable for further loads / roof installations - System solutions for water drainage / roof drainage - Cap strips for securing coving - Anchorage system may be necessary	  *Quality level II Roof*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work		- See above - Requirements / utilisation class - Flat roofs are subject to different uses, resulting in different requirements for the design	Questions: - How is the flat roof to be used? - Only roof sealing with no surface covering, as the roof will only be exposed to foot traffic for maintenance purposes? - Large amount of foot traffic expected due to use as a roof terrace? - Are technical roof installations planned (e.g heavy water tank?) Hence: - The planned use for the roof surfaces must be known. The different quality levels for the design can be derived from this. For example: - Quality level I: Minor requirements, as only thermal insulation and roof sealing. Roof use only for maintenance purposes. Anchorage system may be required for this. - Quality level II: Moderate requirements. Design as utilised roof terrace as continuously frequented by persons. - Quality level III: High requirements as technical installations are present (e.g. water tank, air conditioning and ventilation systems, antennae, solar modules, etc. – subjects such as noise decoupling, load distribution, influence on protective layers, sealing and insulation).	 *planned use for the roof surfaces*  *Quality level I & II*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work Substrate preparation		Building physics: - Heat protection - Damp proofing - Noise protection - Fire protection	Check characteristics of the materials used, e.g. - WLG [thermal conduction rating] (insofar as requirement exists) - Water vapour permeability - Sound (dB), if technical installations are present - Construction materials class(es), if official conditions exist	
		Local conditions, before further details: - Prepare steel reinforced concrete / masonry / roof structure	- Concrete covering adequate? Any reinforcement projecting from the concrete? - Substrate level or rough? - Loose elements removed from substrate, abrasive mechanical cleaning of substrate / cement slurry removed? - Edges broken / chamfers created? - Levelling layers required?	 *Any reinforcement projecting from the concrete?*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work Primer		- Application of bonding primer / spreading Protective goal: Vapour barriers must adhere permanently to the substrate.	- Undercoat / bonding agent applied? - Adequate coverage? - Adequate application thickness?	 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work Bitumen sheeting / vapour barriers / flashing	SBC 1101 Section 905.11 	- Connections / laying / bonding / flashing Protective goal: The raised edge / sealing must not slip off and must be securely and permanently held in place.	- Processing carried out in compliance with manufacturer guidelines? - Vapour barriers continued upwards against rising structure? - Coving adequately secured? - Required joint overlaps complied with? - Joint overlaps directly bonded, needle sampling implemented? - Connections to roof drainage established? - Penetrations sealed?	 *Coving secured*  Coving NOT secured
Flat roof / waterproofing work Insulating materials as substructure Thermal insulation / summer heat protection	SBC 1101 Section 905	- Laying / fastening Protective goals: - Positional stability - Avoidance of thermal bridges	- Adequate insulating material thickness? - WLG complied with? - Thermal insulation butt-jointed without gap? - Must thermal insulations be bonded with foam, for example. Or, fastened on some other way? - Are open joints foamed?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work Surface sealing	SBC 1101 Section 905	- Laying / fastening Protective goal: - Sealing of the roof surface	- Processing carried out in compliance with manufacturer guidelines? - Roof sealing continued upwards against rising structure? - Coving adequately secured? - Required joint overlaps complied with? - Joint overlaps directly bonded, needle sampling implemented? - Connections to roof drainage established? - Penetrations sealed? - Emergency spillways present? - Sealing established at connections, possibly with liquid plastic?	 *UV protected sealing*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flat roof / waterproofing work Roof sealing / connections	SBC 1101 Section 905	- Sealing of connections and rising structural elements Protective goal: - All connections and penetrations must be sealed and permanently waterproof.	- Substrate clean? - Substrate suitable for adhesion of the sealing substances? - Materials suitable? - Connection heights adequate? (≥ 15 cm) - Boots/sleeves used at penetrations? - Leak testing / water testing carried out? - Are window connections continued upwards without gaps at the bottom of window frames and at the side of window frames, as shown in the illustration on the right, e.g. bonded with liquid sealing?	 *Penetrations sealed ?* 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Drainage / emergency spillways	SBC 1101 Section 905	- Roof drainage Protective goal: - Drainage of water	- Adequate number of drainage facilities present? / adequately dimensioned? - Sealing in implemented in a watertight manner? - Adequate number of emergency spillways present and adequately dimensioned? - Drainage of the plot possible? - Connections implemented in a watertight manner? - Sealing systems complied with?	 *emergency spillways*  *Are adequate number of drainage facilities present? And sealed?*
Anchoring systems for fall protection	SBC 1101 Section 905	Safety measures Protective goal: - Protection of persons on the roof surfaces	- Adequate numbers of anchors present, appropriate to the size of the roof surfaces? - Anchor points securely fastened / anchored in? - Penetrations sealed in a watertight manner?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases and (roof) terraces	SBC 1101 Section 905	With new-builds (mineral substrate, built without cellar) Protective goals (general - for the area of the building base and the area of (roof) terraces): - Sealing / protection from penetrating moisture	Minimum requirements for exterior walls, exterior wall coverings, exterior wall openings, exterior windows and doors. The following construction situations generally arise: 1. Building base – Transition from soil to rising structure (masonry/concrete). 2. Building base – Transition from soil to floor-depth window elements on terraces (and roof terraces) Material selection for the sealing of the building base / Have approved systems been used? - Suitable substrate present? - Insulating layer / substrate preparation carried out? - Bitumen sheeting / coating / sealing sheets used? - Liquid plastic at window elements? - Materials UV-compatible? - Protective layers to protect against mechanical damage?	 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases and (roof) terraces	SBC 1101 Section 905	See above Requirements / utilisation class The areas of the base of buildings are subject to different stresses, resulting in the different requirements for the quality of the sealing.	Questions: - What are the moisture demands / what is the load situation at the building base? - Ground moisture? - Pressurised water? Hence: - The load situation at the base of the building must be known (water exposure classes). This results in the different requirements or quality levels for the required sealing. - Quality level I: With regard to the material selection, "only" sealing against ground. - Quality level II: With regard to material selection, sealing against pressurised water / seeping water / occasional standing seepage water, is required.	 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases and (roof) terraces	SBC 1101 Section 905	- Processing of the materials / connection to the structure	Materials / processing / connection to the structure: - Suitable materials present/used for the area in contact with the ground? - Compliance with manufacturers' guidelines? Manufacturers' processing instructions observed? - Sealing edges / floor coving reliably and permanently secured / high enough?	 *Are drainage facilities secured?*
		Building physics - Damp proofing - Fire protection	- Check characteristics of the materials used, e.g. - Water vapour permeability - Construction materials class(es), if official conditions exist	

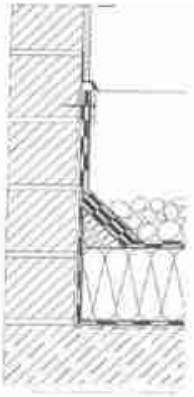
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases **Here: Building base in contact with soil – no cellar built** Preparation/cleaning of the substrate	SBC 1101 Section 905	- Prepare substrate for permanent adhesion of the sealing at the building base	- Building base / transition of floor slab or foundations to rising exterior walls and terraces suitable for the adhesion of sealants? - Substrate level too rough? - Substrate clean and firm overall? - Can the vertical sealing be connected to or bonded with the horizontal sealing? - Are installation joints, for example to floor-depth window elements or other types of penetrations, suitable or prepared for the adhesion of sealing materials?	

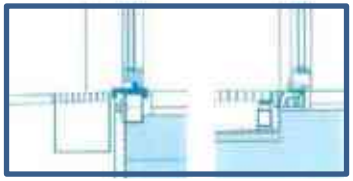
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			- Irregularities rectified? / smoothed? / joints sealed?	
				Can the vertical sealing be connected to or bonded with the horizontal sealing?
			- Concrete primed after cleaning? Prepared for adhesion of sealing materials?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 *Surface leveling* 

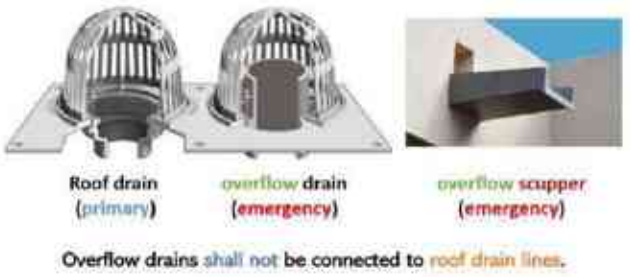
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases **Here: Building base in contact with soil – no cellar built**	SBC 1101 Section 905	- As above <u>Protective goals:</u> - Sealing must adhere permanently to the substrate - Sealing must permanently prevent water in liquid form from reaching the construction materials - Sealing must be protected from mechanical damage	As above, but additionally... <u>With quality level II:</u> Sealing against pressurised water / seeping water / occasional standing seepage water: - Material selection correct? - Appropriate number of layers applied? - Processing carried out in compliance with manufacturer guidelines? - Sealing sheets continued upwards against rising structure? - Coving adequately secured? - Required joint overlaps complied with? - Joint overlaps directly bonded, needle sampling implemented? - Penetrations through the building base sealed? - Sealant height adequate? (≥ 15 cm in finished condition / after completion of the exterior installations) - Protective layer applied before sealing?	  *Joint overlaps directly bonding*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases **Here: Building base at ground level** **Terraces and roof terraces**	SBC 1101 Section 905	As a matter of principle, the aforementioned sealing requirements also apply to ground level terraces and (walk-on) roof terraces.	Prior checking: Does the exit have a step (variant 1) or is it almost threshold-free? (Variant 2) - Processing carried out in compliance with manufacturer guidelines? - Vapour barrier / sealing sheets continued upwards against rising structure? - Coving adequately secured with sheet sealing? - Required joint overlaps complied with? - Joint overlaps directly bonded, needle sampling implemented? - Alternative sealing implemented with liquid plastic?	 *Variant 1 protection, Does the exit have a step?*  *Variant 2: Drainage channels installation*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Waterproofing work on building bases **Here: Building base at ground level** **Terraces and roof terraces**	SBC 1101 Section 905	<u>Variant 1</u> <u>Exit with step</u> Protective goal(s): - The structure sealing must permanently protect the building base from moisture ingress into the building. - The raised edge / sealing must not slip off and must be securely and permanently held in place. - The raised edge of the sealing must be protected from mechanical damage.	- Has the structure sealing been fed ≥ 15 cm over the top edge of the coating? - Is the raised edge of the sealing adequately mechanically protected? - Is there protection from mechanical damage, e.g. though metal sheeting?	Water-bearing layer = Top edge of coating or protective layer or covering material   *Sealing continued upwards against rising structure*
Waterproofing work on building bases **Here: Building base at ground level** **Terraces and roof terraces**	SBC 1101 Section 905	Variant 2 Below connection height of 15 cm, the exit is almost threshold-free.	- Substrate pre-treated? - Material processing carried out in compliance with manufacturer guidelines? - Processing implemented "fresh-on-fresh"? - Adequate material application?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		 (Here, for example, with liquid plastic) Protective goal(s): - The structure sealing must permanently protect the building base from moisture ingress into the building. - No moisture shall penetrate the connection joints. (Liquid plastic is well suited for this).	- Sealing continued upwards against rising structure? - Sealing connected tightly on or under the threshold profiles? - Sealing fed behind shutter guide rails, insofar as shutters are present? (Only in water-splash areas)	 *Damage to insulation coving*
UV compatibility	SBC 1101 Section 905	Material characteristics	- Check UV compatibility if no further covering is planned.	
Raised edge of sealing	SBC 1101 Section 905	Protective goal: The sealing is to be protected from mechanical damage through subsequent works.	- Protective layers applied in front of sealing?	 *Are Protective layers applied before sealing?*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Water drainage channels on terraces	SBC 1101 Section 905	Protective goal: Drainage of rainwater	- Drainage channels suitable? - Tread/tilt-safe drainage channel installation? - Do the channels lead to the roof drains? - Is the sub-structure suitable for drainage hannels?	 *Drainage channels installation*
available solutions for waterproofing as per state of the art :		1- all waterproofing membrane , 2- all waterproofing liqued materiales 3- foam concrete , 4- spray foam , 5- polytex with fibre mish , 6- Thermal insolation. 7- Epoxy 8-self levelling 9-PVC	review specification and material data sheets by manufacturer.	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Roof drainage **SBC 1101** **Section 903** **Section 905**	**Roof drainage:** **Roof drainage:** Unless roofs are sloped to drain over roof edges, roof drains shall be installed **at each low point of the roof.** **Slope:** Modified bitumen membrane roofs shall have a design slope of not less than one-fourth unit vertical in 12 units horizontal **(2-percent slope)** for drainage. **Secondary (emergency overflow) drains or scuppers:** Where roof drains are required, **secondary emergency overflow roof drains or scuppers** shall be provided where the roof perimeter construction extends above the roof in such a manner that water will be entrapped **if the primary drains allow buildup for any reason**. Overflow **drains** having **the same size as the roof drains** shall be installed: • with the inlet flow line located **50 mm above the low point** of the roof. Overflow **scuppers** having **three times the size** of the roof drains and having a **minimum opening height of 100 mm** shall be installed in the adjacent parapet walls with the inlet flow located **50 mm above the low point** of the roof served. The installation and sizing of overflow drains, leaders and conductors shall comply with **Sections 1106 and**	• Are the roof drains installed at the low points of the roof? • Is the roof sloped of not less than 2-percent slope for drainage? • Are secondary emergency overflow roof drains or scuppers installed? • Are the overflow drains size the same as the roof drains? • Are the overflow drains installed with the inlet flow line located 50 mm above the low point of the roof? • Are the overflow drains connected to roof drain lines?	

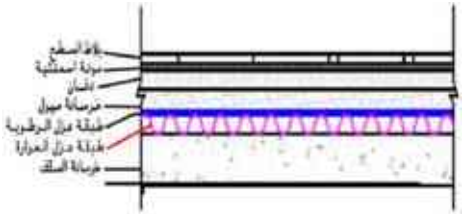
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	1108 of the International Plumbing Code, as applicable. Overflow drains shall discharge to an approved location and **shall not be connected to roof drain lines.**		
	Thermal insulation:		

	Building thermal envelope insulation:
	• The thermal performance of insulation is rated in terms of **R-value**.
	• An **R-value** identification **mark** shall be applied by the manufacturer to each piece of building thermal envelope insulation.
	• For products **lacking** an R- value identification, the manufacturer shall provide the **insulation performance data.**
	• The thermal resistance (R-value) of insulation shall be determined in units of m^2•°C/W.
	• The R-value of **loose-fill insulation** (blown or sprayed) is dependent on both
	  ○ the installed thickness and
	  ○ density (number of bags used).
	
	Therefore, loose-fill insulation cannot be directly labeled by the manufacturer. Many blown insulation products carry a manufacturer's R-value guarantee when installed to a designated thickness, "mm = R- value. "
	
	All materials. systems and equipment shall be **installed** in accordance with the **manufacturer's instructions** and SBC 1102
		• Is all thermal envelope insulation installed in accordance with the manufacturer's instructions and SBC 1102?
		• Does the R-value of thermal envelope insulation meet the code requirements?
			R-value is the resistance to heat flow which means that the higher the product's R-value, the better it is at insulating the home and improving energy efficiency.

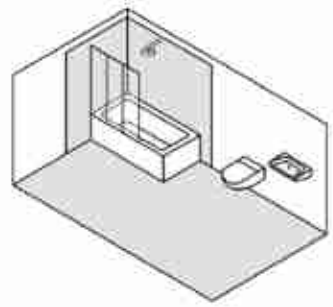
8.6 WATERPROOFING: Sealing of bathrooms/wet rooms

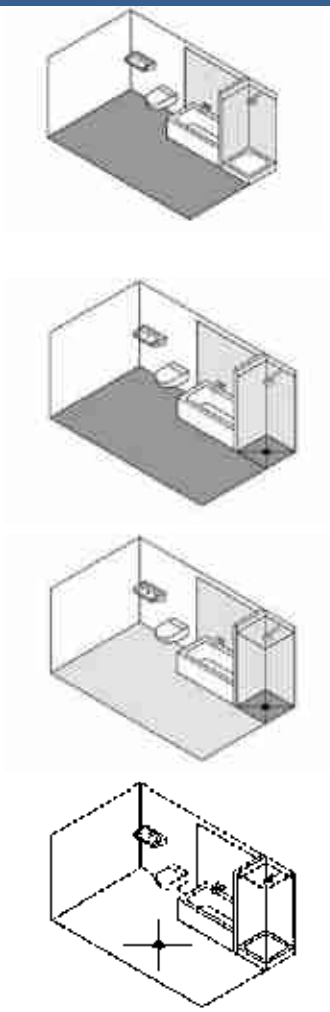
Technical Craft

Sealing of bathrooms and wet rooms

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
Waterproofing in residential bathrooms (bonded damp-proofing) Walls and floors	**General information on waterproofing in bathrooms**			
	SBC 1102 Section 2710 Section 2713 Section 2720 Manufacturer's instructions	General requirements for the waterproofing - Leak-tightness: Waterproofing must protect wall, floor and ceiling constructions from domestic water and cleaning water - Compatibility to the individual construction materials must be assured - The waterproofing shall be applied to the water side - Movements of construction elements shall be absorbed, cracks shall be bridged - The waterproofing shall be protected from mechanical influences (generally due to tiles)		
	Implementation of waterproofing in bathrooms **Quality level 1 (waterproofing in accordance with local planning)**			
	SBC 1102 Section 2710 Section 2713 Section 2720 Manufacturer's instructions	Specifications for implementing the waterproofing: - Built-in baths with showers must have watertight connections between bath and neighbouring wall. - No distinction between moderately impacted surfaces (baths) and highly impacted surfaces (pool areas) - On-site determination: Installation of 1-layer bitumen sheeting	- Clarification: there is no requirement for waterproofing under the tiles in wall areas, only a watertight connection between baths with showers and tiles. No permanent protection against damage due to penetrating moisture in the substrate, damage could arise, screed and coarse layers always damp under tiles	 تفصيلة العزل الحراري للاسطح Adaptation of the construction elements for the floor construction required: On the basis of currently available information, the waterproofing layer is on the floor slab / reinforced concrete ceiling, under insulation and screed. Raised floor construction: 15 cm upstand – Is this upstand still within the floor construction? If not, then additional measures required for laying the skirting tiles, 15 cm skirting tiles.

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		Requirements for the substrate: - Substrate must be capable of bearing the load - The surface must be free of any layers that would reduce the adhesion of the waterproofing - Rectify any ridges, cavities, large cracks, imperfections	- Surface cleanliness - Close gravel pockets / cavities and large cracks - Remove ridges, break edges	
		Requirements for the waterproofing: - Single-layer waterproofing, bitumen sheeting with fabric or polyester fleece insert - Install bitumen sheeting without additional adhesive substances - Overlapping min. 5 cm, per manufacturer instructions, generally 8-10 cm - Uniform bitumen bead at joints - Upstands at wall and components min. 15 cm	- Check whether undercoat is required for substrate - Question: What exactly has been installed as waterproof sheeting – exact designation? - Check overlapping - At butt joints, bitumen mass must emerge as a uniform bead, then the overlap area has been fully welded	
		Requirements for the top layer: - Top layer must protect the waterproofing - Surface must be adequately wear-resistant and non-slip, further information in "Side Inspection for tiling and natural stonework trades"		
	Quality level 2 (waterproofing of floors in quality level 2, plus walls)			
	SBC 1102 Section 2710 Section 2713 Section 2720 Manufacturer's instructions	Specifications for implementing the waterproofing: - Floor waterproofing, see above, quality level 1 - Wall waterproofing in the vicinity of baths and showers (see quality level 3)	- Test conditions derive from quality stage 1 and 3	Clarification:, no reference to high water discharge points (shower head), but rather to drains, i.e. with the arrangement of the shower head at a height of 2.20 m, for example, the area between 1.80 m and at least 2.20 m is unprotected (affects wall waterproofing and wall tiles), the 20 cm has not yet been taken into account here.

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		- Tile height 1.80 m above top edge of the drain, i.e. waterproofing on walls in the shower area is not higher		
		Requirements for the substrate: - Substrate must be capable of bearing the load - The surface must be free of any layers that would reduce the adhesion of the waterproofing - Rectify any ridges, cavities, large cracks, imperfections	- Surface cleanliness - Close gravel pockets / cavities and large cracks - Remove ridges, break edges	
		Requirements for the waterproofing: - See quality levels 1 and 3 - Adequate overlapping between wall waterproofing and floor waterproofing, generally 10 cm, first application of mineral-based wall waterproofing and then floor waterproofing as bitumen sheeting	- Check sequence of wall and floor waterproofing, without expensive additional measures it is not possible to achieve a leak-tight bond between the mineral-based waterproofing and the bitumen sheeting if the bitumen sheeting is installed first and then the mineral-based waterproofing is applied to the walls - Screed and insulation layers remain wet	
	Quality level 3 (waterproofing in accordance with generally accepted codes of practice– Walls and floors)			
		Specifications for implementing the waterproofing: With this implementation, domestic water will be retained by the screed layer and the walls, damage to the screed and wall would not arise with correct implementation. - Water ingress class: W0-I: Low W1-I: Moderate W2-I: High W3-I: Very high - Waterproofing required with: W2-I and W3-I in general	- Is waterproofing required? - Substrate moisture-sensitive? - Estimate the anticipated water ingress and stipulations per table in classes W0-I to W3-I - Can waterproofing be omitted?	Assignment of surfaces to water ingress classes: 

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		W1-I: On floor areas W1-I: On walls, if substrate is moisture-sensitive - No waterproofing required if: W1-I: On walls if substrate is not moisture-sensitive, which guarantees adequate moisture protection, and where domestic water cannot reach moisture-sensitive substrate W0-I: With water-repellent surfaces with adequate protection		

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
				W1-I W2-I *Assignment of surfaces to water ingress classes*
		Requirements for the substrate: - Substrate must be capable of bearing the load - The surface must be free of any layers that would reduce the adhesion of the waterproofing - Rectify any ridges, cavities, cracks, imperfections	- Surface cleanliness - Pores, cracks closed - Remove ridges, break edges	 Substrate not prepared, pores not closed
				 The waterproofing not bonding to the substrate.

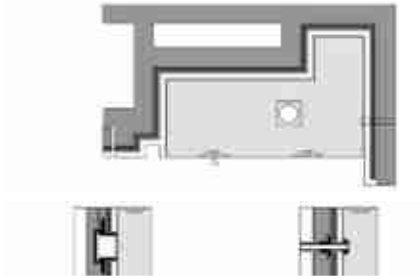
Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
				 The imperfections in the substrate (plasterboard screw here) had not been completely filled. There are still screw heads visible that have not been filled.
		Requirements for the waterproofing: - The waterproofing must be applied with a layer thickness per manufacturer instructions, generally 0.5 mm - The waterproofing should be applied min. 20 cm beyond the water discharge points and 30 cm to the side over the bath and the same in the case of showers without shower screens - On walls incl. door reveals, the waterproofing should be applied 5 cm high all around - The transition between floor and rising structure should be established such that the movements of the individual structural components can be absorbed and maintained permanently sealed (for example by means of sealing tape) - Connections at break-throughs (piping parts, flush-mounting boxes) should be created watertight ideally by means of sealing boots/sleeves	- Visual check of the layer thickness, even application - Take samples if there are indications of inadequate layer thickness, for example substrate shows through, uneven application	

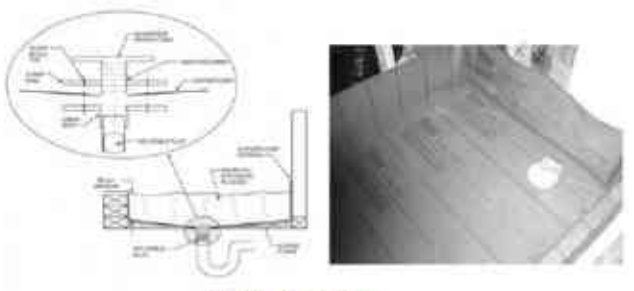
Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		- Drain plugs, floor drains and channels are to be integrated tightly into the waterproofing		
			- Checks for the manufacturer introductions for processing, layer thickness, application can be found in the technical datasheets or on the packaging	 According to the manufacturer's instructions, the layer thickness must be min. 0.5 mm. The waterproofing is approved for water ingress classes W0.1 and W1.1 on the wall surfaces.
			- Check installation of sealing tape in the connection areas floor-wall and wall corners on showers and baths - Check the system conformity of the individual components of the waterproofing	Sealing tapes are bonded into baths all around the wall-floor area of bathrooms.
			- Check the creation of the watertight connections to fittings and penetrations	

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
				Pre-finished sealing boots/sleeves are installed at the flush-mounted fittings.
				 The sealing tape is not completely and fully bedded into the bonded damp-proofing.
				  The bonded damp-proofing is not high enough.

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
				The bonded damp-proofing must be laid min. 20 cm beyond the top edge of the shower head. No waterproofing can be detected under the wall tiles, which have already been fitted.
Pool waterproofing	**General information on waterproofing basins and pools**			
	SBC 1102 Section 2710 Section 2713 Section 2720 Manufacturer's instructions	Requirements for the waterproofing: - Waterproofing implementation depends on location: - Free-standing basin/pool – low requirements for waterproofing - Basin/pool on building or in building, higher requirements for waterproofing - See above for further requirements - See above for supplementary information		
	Implementation of waterproofing in basins and pools			
		Specifications for implementing the waterproofing: no separate information on the implementation in the area of pools, see above for implementation and information (quality level 1). See the following explanations for the permanent protection against penetrating moisture with highly impacted areas: - Differentiation to be made between basins and pools that are directly used and those that are furnished with a surface covering - The water ingress classes are dependent on the depth of the basin/pool: W1-B: Fill height up to 5 m W2-b: Fill height over 5 m		Clarification: How was the waterproofing in pool areas carried out on-site previously? Pool areas: Classification of highly impacted areas – increased requirements on the waterproofing system and its connections.

Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		- Basins/pools that are directly used can be waterproofed with rigid or flexible mineral-based waterproofing slurries Basins/pools with ceramic coverings as a wear layer – bonded damp-proofing possible using crack-covering waterproofing slurries or crack-covering reaction resins, whereby there are in-creased requirements on crack covering - Do not apply waterproofing until the substrate has dried all the way through		
		Stipulations for crack class: - Categorisation of the substrate into crack classes: R0-B: No changes in crack width or new cracks expected R1-B: With cracks up to 0.2 mm R2-B: With cracks up to 0.5 mm R3-B: With cracks up to 1.0 mm and a crack offset up to 0.5 mm	- Check extent to which the substrate (generally, concrete) has dried out - Check the crack width	
		Stipulations for the location: S1-B: Free-standing, outside S2-B: Outside erection, adjoining buildings and inside		
		Requirements for the substrate: - Substrate must be capable of bearing the load - The surface must be free of any layers that would reduce the adhesion of the waterproofing, cleaning with sand blasting or high-pressure jet - Cavities, imperfections and cracks ≥ 0.2 mm to be rectified - Ridges to be removed - Substrate may be moist, no water film	- Surface cleanliness - Pores, cracks closed - Remove ridges, break edges	

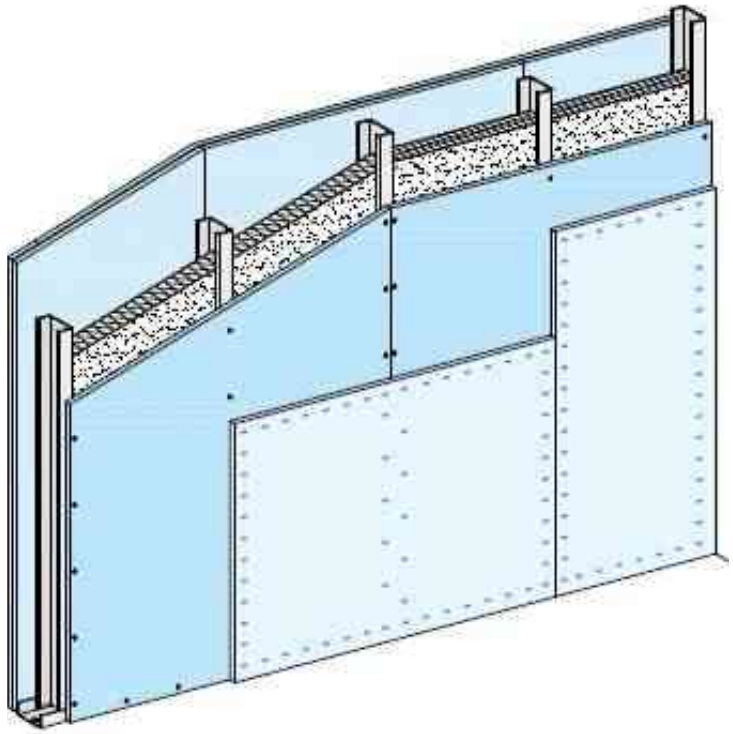
Craft	Basics/Standards	Technical function	Inspection scope	Defects, findings and notes
		Implementation of waterproofing: - In the case of indoor pools, with a wear layer of tile or natural stone, the waterproofing in the interior area to be created with crack-covering bonded damp-proofing systems, in outdoors areas a non-crack-covering waterproofing system can be used - Old concrete substrate: - non-crack-covering mineral-based waterproofing system: Min. age ≥ 6 months - crack-covering mineral-based waterproofing system: Min. age ≥ 3 months - Liquid plastic: Min. age ≥ 28 days - Bonded damp-proofing systems: ≥ 6 months - Min. dry layer thickness (standard applications): Liquid plastic: min. 2 mm, Bonded damp-proofing: min. 1 mm or per manufacturer instructions - Assurance of the min. dry layer thickness by addition of min. 25% to the layer thickness - Penetrations to be sealed with adhesive, welded or loose/fixed flanges, min. flange width 50 mm - Waterproofing to be continued at least 15 cm above the highest water level or in indoor areas up to the edge of the pool and to be joined there to the floor waterproofing in such a way as to prevent water running in behind (see above for implementation)	- Check extent to which the substrate (generally, concrete) has dried out - Check the crack width - Stipulation of waterproofing system, sheeting or mineral waterproofing slurries or bonded damp-proofing - Check the connections and layer thickness - Check material application/consumption, determination per m², if there are indications of inadequate layer thickness min. 10 individual measurements, accurate to 0.1 mm	  Connections to penetrations not connected in a watertight manner. Sealing tape missing in the floor-wall connection areas, the connections have not been implemented in a watertight manner. Waterproofing obviously not applied in the required min. thickness, substrate showing through.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Shower liner test **SBC 1102** **Section 2503**	**Shower liner test:** Where shower floors and receptors are made **watertight**, it shall be tested as follows: • The pipe from the shower drain shall be **plugged** watertight for the test. • The floor receptor area shall be **filled** with **potable water** to a depth of **not less than 50 mm** measured at the threshold. • Where a **threshold** 50 mm in height **does not exist**, a temporary threshold shall be constructed to retain the test. • Water in the lined floor or receptor area to a level not less than 50 mm in depth measured at the threshold. • The water shall be retained for a test period of **not less than 15 minutes** and there shall not be evidence of leakage. The **evidence of leakage** could be either: 1. The lowering of the water level from the full threshold level or 2. Water drips/seepage outside of the receptor area.	• Are shower floors and receptors water tested as per the code requirements? • Is the water test period less than 15 minutes?	 Shower liner test

8.7 Architectural / Finishing: Dry construction works

Technical Craft

Dry Construction Works



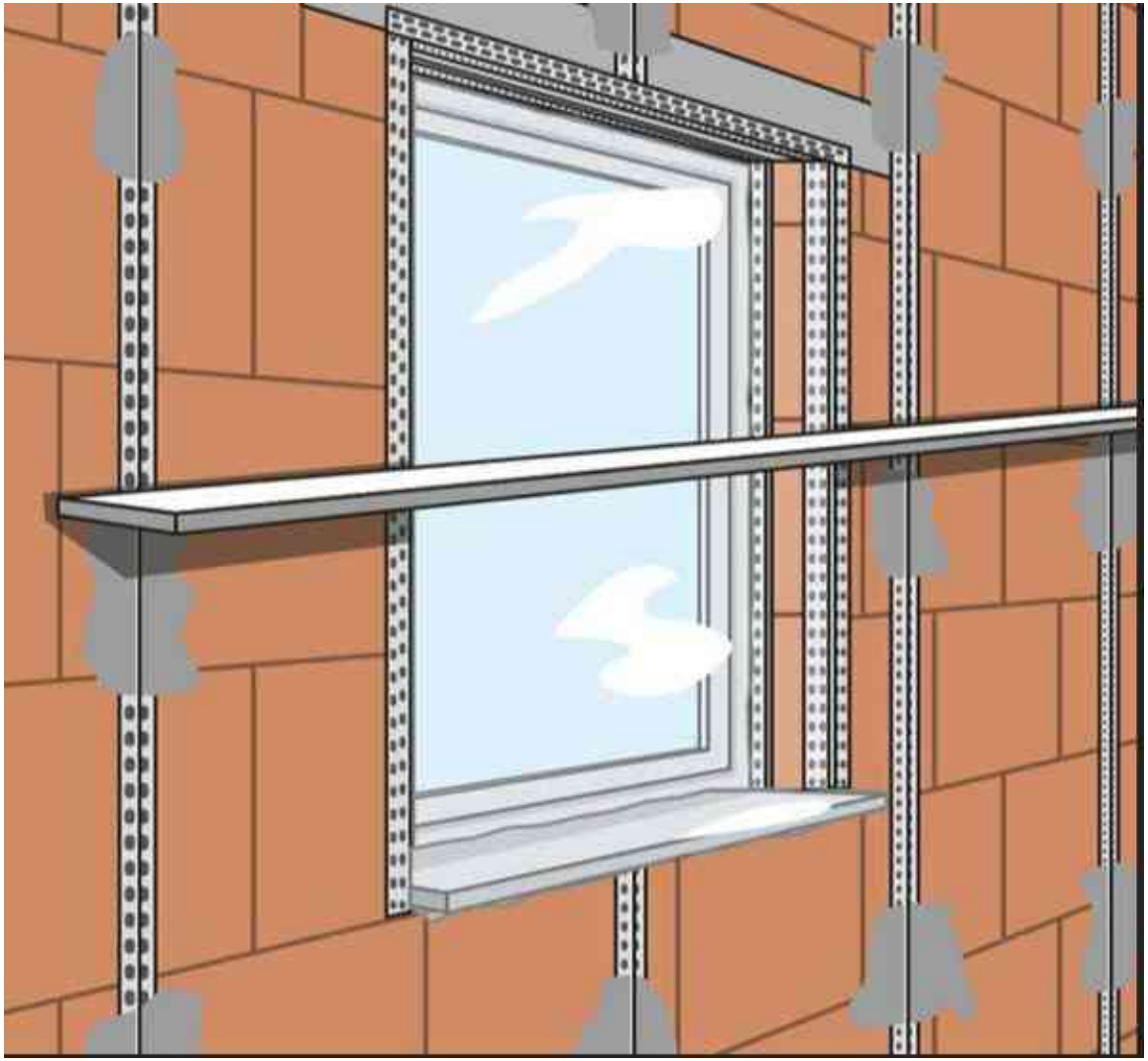
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Dry lining Walls and ceilings	**Generally applicable to dry lining works**			
	SBC 1101 Section 8A2 Section 1005 Section 1006	- Dry lining walls comprise sub-structure made of metal or wood (single-stud or double-stud installation), which is connected to the neighbouring construction elements all the way round, panelled on both sides with one or two layers, intermediate space can be filled with insulating wool (depending on the installation situation and requirements for the wall) - Fire and noise protection in separate chapters, fire protection. - Gypsum plasterboards as a base for wall coverings and tiles: Observe: Agreed surface characteristics Clarification: Are similar surface qualities to Q1 to Q4 agreed in Saudi Arabia? - According to the current planning status, there are no exterior walls intended to be constructed using the dry lining system. If this changes, select wall constructions that take wind forces and seismic loads into account - Dry lining systems in accordance with approved systems and must comply with manufacturers' instructions – see documentation - Normal gypsum plasterboards shall not be installed if these are directly exposed to the weather – in this case, special gypsum plasterboards are to be used - Dry lining materials are to be protected from the influence of weather	- What dry lining systems were installed? Single-stud walls: - Single-panelled - Double-panelled Double-stud walls: - Single-panelled - Double-panelled - Sub-structure: Wood studwork and/or metal studwork? What is generally installed? - Earthquake zones: Observe seismic loads with dry lining systems – Is this relevant to the residential construction (2-storey detached and terraced houses) being considered here? - Fire protection: No fire protection requirements within detached/terraced houses. Are dry lining walls used as separating walls between residences? - clarification. - Documentation: The materials and systems are to be documented throughout the construction period - Systems used: Permissible in accordance with manufacturers' instructions or construction permit - Observe construction stage: Installation of dry lining system without weatherproof shell (walls, roof, windows), then protect gypsum plasterboard (and, wooden structure if used)	Question: The photographs submitted do not show dry lining construction, only suspended ceilings as arched ceilings. Is that the norm?

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Sub-structure	Requirements for the structure/studwork: - Profiles (Metal studwork / wooden slats) are joined with screws or nails - Construction joints in the body of the building incorporated into the dry lining system (not generally required with detached and terraced houses) - Connect profiles / load-bearing structure to adjoining structural elements with acoustic sealant or sealing strips - Connections to ceilings: Check the spans of the ceiling. If large ceiling deflections are anticipated (> 10 mm, large spans), provide sliding joints - Panel thickness for the metal profiles depending on the manufacturer, generally 0.5 to 0.6 mm - If metal profiles are used, set these in - Do not screw to the UW profiles - Bracket loads: Single-stud walls: Up to 0.7 kN/m with min. 18 mm thick panelling; Double-stud walls: Up to 0.7 kN/m, if double studwork interconnected with tensile-resistant connection; Observe manufacturer instructions. - Wall heights: With heights > 2.60 m and door leaves > 25 kg, install reinforced profiles (UA profiles), fastened to floor and ceiling with brackets (screwed) - Plumbing walls: With sanitary installations mounted on studwork (without anchoring to solid wall) install reinforced profiles, screwed to floor and ceiling with brackets - Fastening of the load-bearing profiles to solid walls, ceiling and floors – spacing of the fasteners ≤ 100 cm	- Check flatness, surface and strength of substrate – selection of the fasteners and wall/floor plugs to suit substrate - Question: How large are the spans generally? Are large ceiling break-throughs anticipated? If yes, the "sliding ceiling joints" detail should be added - Check load-bearing system against manufacturer instructions and execution details - Question: Are cabinets or other loads connected to dry lining walls – bracket loads? - Bracket loads permissible per manufacturer instructions or additional measures (reinforcements) required - Check room heights and doors – pos. additional measures required at door openings	

8.8 Architectural / Finishing: Plastering works inside and outside

Technical Craft

Plastering (inside | outside)



Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Interior plastering work Walls and ceilings	**General information on interior plastering**			
	SBC 1101 Section 8A Construction documents	Interior plastering requirements: - Making the airtight building envelopes on the inside; - Substrate for subsequent wallpapering and / or painting work or for laying tiles or natural stone; - Movements from structural members must be absorbed, cracks are to be avoided through appropriate measures; The surface produced must satisfy the evenness and visual requirements for the subsequent coating;		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Execution of the interior plastering work				
		Substrate requirements: - The substrate must be load-bearing; - The surface must be free from adhesion-reducing constituents and layers to ensure the plaster can be properly applied and hold; - The masonry must be laid with closed joints for use as a substrate (otherwise risk of cracking – levelling plaster coat necessary); - Burrs, voids, cracks, holidays (discontinuities) and possibly protruding reinforcement constituents must be removed, or must be secured against rusting by applying a suitable coating; - The surface of the masonry-concrete must meet the evenness requirements required as a plastering background;	- Surface cleanliness; - Closed pores, cracks; - Adequate adhesion of the substrate available - Burrs removed, protruding or missing mortar joints are removed or filled; - Reinforcement steel is not visible in the surface of ceilings/walls or is sealed	 Gaps exist in masonry joints  Material changeovers from concrete to masonry: Prime and insert reinforcement mesh  Plastered areas are not continued up to the top of the floor.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Execution of the interior plaster: - The layer thickness of the interior plaster, according to must accepted engineering practice, must be 15 mm for plasters (all. minimum thickness 10 mm), and 10 mm for ready-mix dry mortars (all. minimum thickness 5 mm); - The interior plaster must be applied over the entire wall height from the top of the floor to the bottom of the ceiling; - Reinforcement mesh must be inserted to reduce cracks in case of material changes (masonry - concrete) or in the area of roller shutter boxes; - The evenness must meet the requirements of the subsequent coating or the respective design requirements; - A trowel groove must be made between the wall and ceiling plaster or between the wall and gypsum board frieze or gypsum board ceiling;	- Visual inspection of the layer thickness, uniform application; - Take samples in case of indications of too thin layer thickness, for example, substrate can be seen through plaster, non-uniform application; - Visual inspection of the completeness of the full surface plaster application over the entire wall height - If necessary, random checking of the installation of the mesh inlay by means of destructive testing, if indications question its installation Visual and if necessary measurement check of the required or specified evenness of the plastered areas	 Required eveness achieved, surface coverage

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Exterior plastering work/rendering	**General information on exterior plastering**			
	SBC 1101 Section 8A Construction documents	Exterior plaster requirements: - Making the outside watertight; - Appearance, representative function of the building from the outside - Plaster must be matched to the subsequent coating with regard to material, coat thickness, use/application and requirement; - The compatibility of the individual construction materials must be ensured; - Movements from structural members must be absorbed, cracks are to be avoided through appropriate measures; The surface produced must satisfy the evenness and visual requirements for the subsequent coating;		

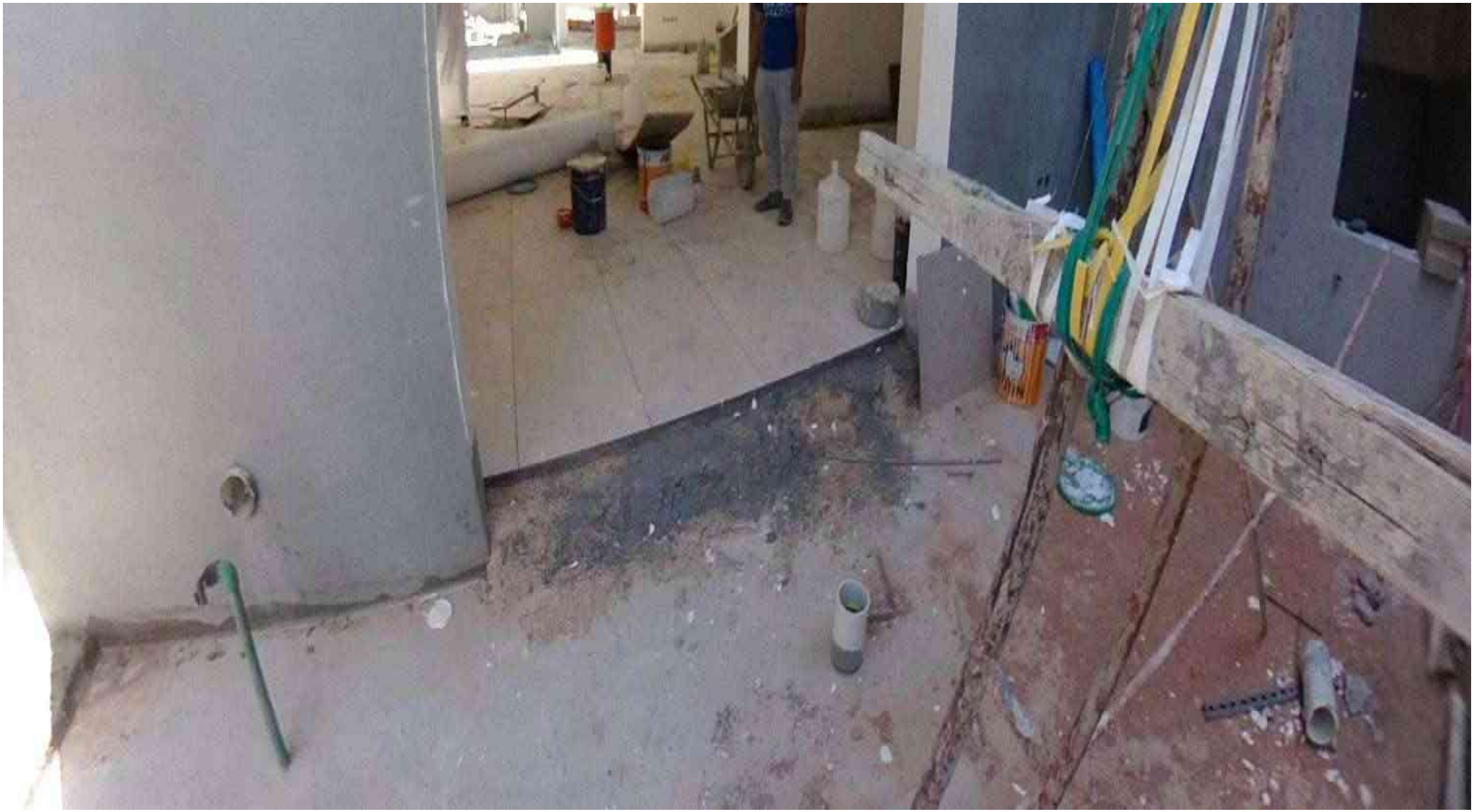
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Execution of the exterior plastering work			
		Substrate requirements: - The substrate must be load-bearing; - The surface must be free from adhesion-reducing constituents and layers to ensure the plaster can be properly applied and hold; - The masonry must be laid with closed joints for use as a substrate; masonry mortar and blocks must form a single plane; - Burrs, voids, cracks, holidays (discontinuities) and possibly protruding reinforcement constituents must be removed, or must be secured against rusting by applying a suitable coating; - The surface of the masonry-concrete must meet the evenness requirements required as a plastering background; - The shelf/pot life and application temperatures of the plaster materials must be noted; - Ensure any necessary measures.	Solution _ Fibreglass Mesh   or steelmesh 	 *Gaps exist in masonry joints, material changeovers from concrete to masonry: Apply tack coat and lay reinforcement mesh in the plaster.*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Execution of the exterior plaster: - The coat thickness of the exterior plaster for ready-mixed dry mortars 15 mm (allowable minimum thickness 10 mm); - Reinforcement mesh must be inserted to reduce cracks in case of material changes (masonry - concrete) or in the area of roller shutter boxes; - The evenness must meet the requirements of the subsequent coating or the respective design requirements; - The visual surface, smooth/felted must meet the requirements of the specifications, if applicable use quality levels Q1-Q4; - Measures must be taken in the outdoor area in which flash setting, i.e. plaster dries too quickly before it has set, cannot occur.	- Visual inspection of the layer thickness, uniform application and evenness - Take samples in case of indications of too thin layer thickness, for example, substrate can be seen through plaster, non-uniform application;	 *Evenness of the plastered areas*

8.9 Architectural / Finishing: Screed works, flooring works, natural and concrete stone works, tile works, parquet flooring

Technical Craft

Screed Works, flooring works etc.

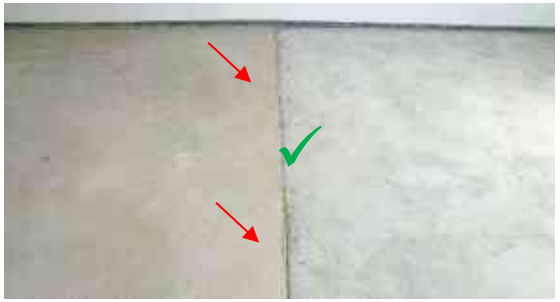


Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Screed	**Preparation**			

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Floating screed - Durability - Compressive strength - Flexural tensile strength - Uniform thickness - Surface smoothness/ evenness	SBC 1101 Section 905 Construction documents	Prevention of sound bridges Avoidance of fluctuations in screed thickness	Load-bearing substrate: - Evenness - Cleanliness - Pipes (drinking water, wastewater) present? - Electric cables present?	 *Pipes (drinking water, wastewater) & Electric cables present?*

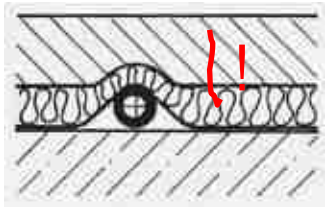
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Floating screed - Durability - Compressive strength - Flexural tensile strength - Uniform thickness - Surface smoothness/ evenness -	SBC 1101 Section 905 Construction documents	Prevention of sound bridges Prevention of thermal bridges Prevention of cracking Insulation material resilience (compliance)	Insulation layer - Planned layer thickness present? - Allowable insulation material installed? - Insulation boards laid tightly and in laying pattern/bond? - Pipes covered? - Bonded fill materials used to fill voids and cavities? - Bonded fill materials used to fill voids and cavities?	 Planned layer thickness present?  Allowable insulation material installed?

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1101 Section 905 Construction documents		Insulation layer - Planned layer thickness present? - Allowable insulation material installed? - Insulation boards laid tightly and in laying pattern/bond? - Pipes covered? - Fill materials used to fill voids and cavities?	 Insulation boards laid tightly and in laying pattern/bond?
Floating screed - Durability - Compressive strength - Flexural tensile strength - Uniform thickness - Surface smoothness/ evenness	SBC 1101 Section 905 Construction documents	Prevention of sound bridges Avoid moisture penetration in insulation material	Separation layer / cover for insulation layer - Has insulation been completely covered with PE sheeting? - Has the PE sheeting been adequately overlapped or the sheet joints sealed with adhesive? - Is adhesive bonding or adequate covering present by continuing up the wall with the perimeter strips?	 *Has insulation been completely covered with PE sheeting?*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Screed Floating screed	Fitness for purpose	Prevention of cracking	Joint arrangement / screed bays - Have expansion joints been created or extended from the substrate? - Have induced contraction joints been made to subdivide the screed areas into approx. 30 m² bays (e.g. in the area of door openings)?	 Have expansion joints been made or extended from the substrate?
Screed Floating screed	Fitness for purpose	Prevention of cracking	Joint arrangement / screed bays - Have expansion joints been created or extended from the substrate? Have induced contraction joints been made to subdivide the screed areas into approx. 30 m² bays (e.g. in the area of door openings)?	 Have induced contraction joints been made?

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Screed Floating screed	Fitness for purpose	Prevention of cracking Avoidance of strength loss	Construction status - Can the existing facade and building openings be closed (at least temporarily)? - Can constant climate conditions be maintained (cooling, heating, moisture addition due to rain)? Air draughts due to cross ventilation is to be avoided	 *Can building openings be closed (at least temporarily)?*
Screed Floating screed	**Errors / defects / damage**			
	SBC 1101 Section 905	**Defect**	**Effect**	
		Perimeter strip too low / missing	- Sound bridges between the set screed layer and the walls	 Perimeter strip too low / missing

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
				 Perimeter strip too low / missing
		Perimeter strips not laid tightly in the corner	- Discontinuity / void during subsequent laying of the flooring	 *Perimeter strip too low*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Screed Floating screed	SBC 1101 Section 905	Joints are not planned or created	- Random cracking (non-linear) in the screed	 *Cracking in the screed*
Screed Floating screed	SBC 1101 Section 905	Non-uniform layer thicknesses / thickness reduction above pipes/cables	- Risk of fracture of set screed / loss of bearing capacity	  *Risk of fracture of set screed*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Screed sections larger than 30 m² or longer than 6 m	- uncontrolled cracking due to screed shrinkage processes during curing / loss in load-bearing capacity	 *Uncontrolled cracking due to screed shrinkage processes*
Construction above as per state of the art, thermal insulation and accoustic seperation	please check available design	potential exemption due to residential use.	check design against construction.	note non conformity

فحص
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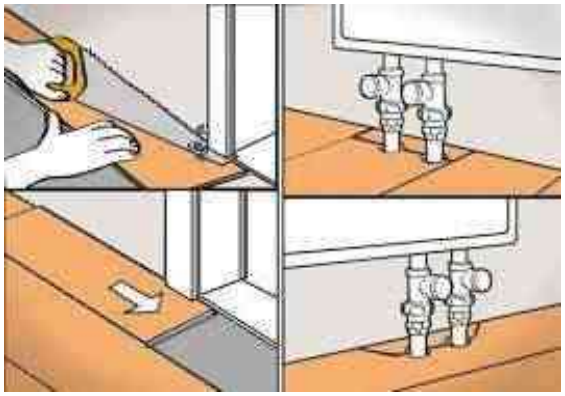
Flooring Works

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Flooring works **Textile floorings** **PVC floorings** - Surface smoothness/evenness - Durability - Visual appearance - Fire performance	**Flooring work preparation**			
	SBC 201 Section 804 Manufacturer's instructions Construction documents Contract documents	- Ensuring durability - Visual appearance	Firm, load-bearing substrate / substructure: - Evenness adequate, otherwise levelling measures required? - Level differences exist? - Cleanliness / substrate cleaned? - Surface strength of screed sufficient?	 *Too fast drying / loss of strength*  *Moisture content of screed*

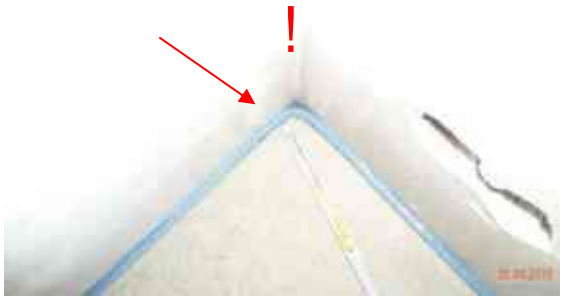
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 201 Section 804 Manufacturer's instructions Construction documents Contract documents	- Ensuring durability	Firm, load-bearing substrate / substructure: - cracking in substrate / substructure - Moisture content of substrate / substructure - (Cement screed ≤ 2.0 % CM, calcium sulphate screed / anhydrite ≤ 0.5 % CM)	 

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 201 Section 804 Manufacturer's instructions Construction documents Contract documents	- Crack prevention	Firm, load-bearing substrate / substructure: - Are expansion joints / movement joints present in the substrate? - Have induced contraction joints for subdividing the screed areas (e.g. in the area of door openings, screed bays) been closed by means of form fit (keying)? - Have shrinkage cracks been closed by means of form fit/keying?	 Have induced contraction joints been closed by means of form fit (keying)?

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 201 Section 804 Manufacturer's instructions Construction documents Contract documents	- Visual appearance	Material selection - Is the flooring (carpet, PVC flooring) to be laid patterned? - Does the flooring (carpet, PVC flooring) have a pattern repeat (pattern offset)?	  *Is the flooring (carpet, PVC flooring) to be laid patterned?*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Fitness for purpose	- Ensuring durability - Visual appearance	Material selection / laying - Are manufacturer's laying instructions available for the flooring (carpet, PVC flooring)? - Is the selected adhesive suitable for the substrate?	  *Manufacturer's laying instructions*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Fitness for purpose	- Ensuring durability - Visual appearance	Protective surface finish coating - Is a protective surface finish coating required following completion of the flooring work? - Has the protective surface finish coating been applied properly? - (One-off or multiple application, uniform application, avoid dirt inclusions)	 *Is a protective surface finish coating required?* 
	SBC 201 Section 804 Manufacturer's instructions Planning Construction experience	**Defect**	**Effect**	
		Substrate too wet	- Detachment of the bonded flooring (carpet, PVC flooring) from the substrate - Blistering/bubble formation in case of damp-proof floorings	 *Detachment of the bonded flooring*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Substrate cracking	- Are there creases in the flooring (carpet, PVC flooring)? - Straight creases – induced contraction joints in the substrate before laying flooring not closed by means of form fit (keying) - Irregular creases – cracking due to screed shrinkage before laying the flooring not closed by means of form fit (keying)	 *Irregular creases*
		Discontinuities/voids in substrate	- Are there identifiable discontinuities/voids in the substrate? - Room corners with improperly laid perimeter insulation strips (“round“ corners) produce discontinuities/voids	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Laying errors Pattern / sheets	- Are the pattern offsets noted (pattern repeat)? - Are the butt joints between the sheets tight and inconspicuous?	 *Are the butt joints between the sheets tight and inconspicuous?*
		Laying errors Cut-to-size pieces	- Cutting work at installations (floor boxes for electrical installations) is precise fitting? - Cut-to-size pieces at adjacent members (walls, columns, stairs) are precise fitting?	 *Cut-to-size pieces at adjacent members*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Laying errors Laying direction	- Are the sheets laid uniformly / in the same direction? - (Changes in laying direction lead to visually conspicuous colour differences)	 *Changes in laying direction*

فحص
جودة البناء

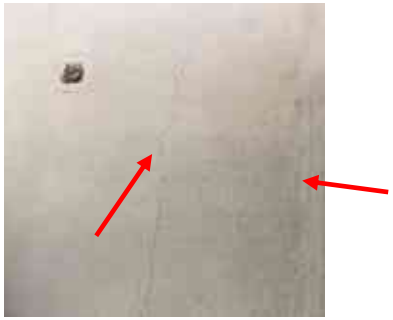
Natural / Concrete Stone Works and Tiling

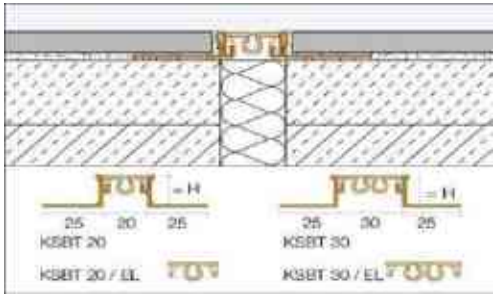
<table>
<tr><th>Craft</th><th>Basis / Standards</th><th>Technical function / quality</th><th>Inspection scope</th><th>Defects, findings and notes</th></tr>
<tr><td>Natural/concrete stone work / tiling work
Floors/stairs
Balconies
Terraces</td><td colspan="3">General information on natural/concrete stone and tiling work</td><td></td></tr>
<tr><td></td><td>SBC 1101
Section 905.3
- Accepted engineering practice:
- Design documents;</td><td>- Substrates in Saudi Arabia are generally concrete or cement screed;
- Floors in toilet rooms and bathroom floors must have a smooth, hard, non-absorbent surface, with at least 15 cm high base tile all around on the walls;
- Mineral adhesive to ANSI A108.1A and ANSI A108.1B;
- Laying of the natural stone tiles in thin-bed mortar;
- Laying of the natural stone slabs / large tiles laid interlocking or laid floating;
- Note joint widths depending on the tile sizes. The standard width is 3 mm. Fluctuations in tile/slab sizes are to be compensated for by the joints and as a result the joints can be 2-4 mm wide;
- Joints in corners and at ends/joints approx. 5 mm wide;
- Continue construction joints and expansion joints from the substrate into the natural stone coverings;
- Fill natural stone joints uniformly by slurrying;
- There must be no adhesive or rigid jointing compound in corners and joint areas of the floorings, as there is a risk of spalling and cracking in natural stone coverings, and sound bridges;
- Laying tolerances according the local requirements</td><td>- The stone and tile floorings, laid in thin bed mortar, can generally not be walked on for 7 days, depending on the laying of natural stones in thick bed with formation of gradient and through-drying of substrate;
- General weather effects, in particular when laying the tiles in the flat roof area;
- Check the laying tolerances on site (construction site check)</td><td>
<table>
<tr><td>Ceramic material</td><td>Joint width</td></tr>
<tr><td></td><td>[mm]</td></tr>
<tr><td>Ceramic tiles</td><td></td></tr>
<tr><td>- up to 150mm</td><td>~ 2</td></tr>
<tr><td>- more than 150mm</td><td>from 2 to 8</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Ceramic split tile</td><td rowspan="2">from 4 to 10</td></tr>
<tr><td>Clincer slab</td></tr>
<tr><td></td><td></td></tr>
<tr><td>Facing stones > 300mm</td><td>min. 10</td></tr>
</table>
Recommended joint widths.
<table>
<tr><td>Tile size</td><td>hight tolerance</td></tr>
<tr><td></td><td>[mm]</td></tr>
<tr><td>10/10 cm</td><td>1,2 mm</td></tr>
<tr><td>30/30 cm</td><td>1,6 mm</td></tr>
<tr><td>40/40 cm</td><td>1,8 mm</td></tr>
<tr><td>30/60 cm</td><td>1,9 mm</td></tr>
<tr><td>50/50 cm</td><td>2,0 mm</td></tr>
<tr><td>60/60 cm</td><td>2,2 mm</td></tr>
</table>
Examples of allowable laying tolerances.

- Allowable height offsets beyond respective code requirements.

- Tolerances of stone and tiles not fulfilled

- Joints at corners and ends filled or below required width</td></tr>
</table>

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Substrate requirements: - The substrate must be load-bearing; - The surface must be free from coats or layers that reduce adhesion, - Cracks and discontinuities/voids are to be removed; - The allowable residual moisture of the substrate may not be exceeded;	- What material? - Check the absorbency of the substrate; - Clean the substrate, pre-wet if necessary, remove sand; - Does sinter form on concrete surfaces? - If necessary, prime; - Test the moisture of the substrate, use of measuring electrodes sufficient (e.g. Gann Hydromette), take sample from screed floors and take measurement using calcium carbide method (CM method)	 Remove hollows and cracking.
		Natural stone requirement: - Hard, water repellent surface - Visual standards (appearance)	- Check manufacturer's certificate / delivery notes; - Comparison with American National Standard Specifications	
		Tile/slab laying requirements: - Clean natural stone immediately after jointing; - Check distances of tiles in corner area; - Making of elastic joints in the corner areas and at installations; - Make monolithic joints uniformly and almost flush with the surface of the natural stone; - In case of large-format natural stones, possibly necessary to apply a filler to achieve a uniform smooth substrate area; - Setting time of the adhesive is delayed compared to small format tiles/slabs	- Check the substrate (evenness and plumbness: Wall finished: 5 mm/ 1 m 7.5 mm/ 2.5 m Floor finished: 4 mm/ 1 m 10 mm/ 4 m - Definition of laying methods; - Note the setting time of the adhesive; - Cleaning of the natural stone after jointing, otherwise jointing material sticks to natural stone and can then only be removed with increased effort	 Elastic jointing missing.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		General joints information: - Joints must be designed by the designer; - Deeper joints are to be backfilled; - Joints in the substrate are to be continued in the natural stone flooring Type of joint: Bay limiting joint – see screed, mostly with beads; perimeter joint (floor-wall), mostly elastic joints; connecting joints, mostly elastic joints		 Non-uniform hard joints made in the area of the floor inlet.
		Joint profile requirements: - Installation directly above bay boundary joint; - Joint profile made of plastic or metal; - Installation in tile adhesive plane Alternative: Sealing! .. please check design	- Note and follow the installation instructions of the manufacturer alternative : elastic sealing	  Exemplary expansion joint profile.
		Manufactured stone requirements:	- Check delivery notes, tile material suitable?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- The slabs must be approved for outdoor use, i.e. weather may not cause any damage to occur (spalling and cracks); - Temperature resistance; - Slip resistance; - Identical colours	- Note slip resistance	

		Tile laying requirements:
		- A drainage layer must be laid under the covering/surfacing in the weathered areas;
		- pay attention to pot life of adhesives and use of slabs in direct sunshine;
		- allow for smaller bay areas in areas exposed to sunshine;
		- Joint material matched to joint width (temperature behaviour, moisture absorption, wear);
		- Joint widths in the mortar bed:
		  - largest edge length up to 60 cm: 3 mm
		  - largest edge length over 60 cm: 5 mm
		- Joint widths without mortar bed, e.g. on paving support pads 5 mm;
		- Make joints by means of slurrying
			- Weather: do not lay slabs in direct sunshine (adhesive “burns”, slabs detach);
			- Check jointing material, joint width under use conditions;
			- Question: How are the slabs laid outdoors?	

		Miscellaneous: - Protection of natural stone from damage and dirt	- Site supervision’s stipulations regarding cleaning and protective measures during the construction period	 Protect floorings, avoid dirt.

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Tiling work in Wetrooms				
		- Walls within a radius of 60 cm of urinals and water closets must have a smooth, hard, non-absorbent surface up to a height of 1.2 metres above the floor, materials moisture resistant, Exceptions: 1. Residential units and sleeping units (bedrooms), 2. Toilet rooms, which are not accessible to the public and have no other fixtures than a water closet; - Tiles glazed or unglazed - Mineral tile adhesive to ANSI A108.1A and ANSI A108.1B; - Laying of the tiles in thin bed mortar; - Laying of the tiles using the floating method (apply tile adhesive to walls and floors) or floating-buttering method (tile adhesive applied to floors/walls and simultaneously on tiles; - Note joint widths depending on the tile formats (see Table); Joints in corners and at ends/joints approx. 5 mm wide; - Continue construction and expansion joints from the substrate into the tiling; - Fill tile joints uniformly by slurrying; - There must be no tile adhesive or rigid jointing compound in corners and joint areas of the tiles, as there is a risk of spalling and cracking in tiles and sound bridges Tile laying tolerances: Sum of the allowable tolerance from trade laying tolerance (1 mm) and material-related		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		dimensional tolerance (depending on the tile format)		
	SBC 1101 Section 905.3	Based on concrete and clay roof tiles, the following notes on execution and quality of the tiles in the outdoor area: **6.7.3. Clay and concrete tile.** The installation of clay and concrete tile shall comply with the provisions of this section. **6.7.3.1 Deck requirements.** Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.	- Roof slope: According to information, flat roofs are built, less than 21%; check on site, additional requirements to may possibly result. (are not listed here as not present there); - Examination of the ASTM standards	
		Tile requirements: Hard, water repellent surface	- Check manufacturer's certificate / delivery notes; - Comparison with American National Standard Specifications	
		Tile laying requirements: - Shower partitions and walls above baths with installed shower must be tiled up to a height of 1.80 m above the waste outlet; - the connections between tiles and bath tabs must be watertight; - removal of the tile spacers, creation of a uniform jointing plane; - clean tiles immediately after jointing; - tile distances in corner area approx. 5 cm; - Making of elastic joints in the corner areas and at installations such as bath and pipes; - Make monolithic joints uniformly and almost flush with the surface of the tiles; - In case of large-format tiles, possibly necessary to apply a filler to achieve a uniform smooth substrate area;	- Check the substrate (evenness and plumbness: Wall finished: 5 mm/ 1 m 7.5 mm/ 2.5 m Floor finished: 4 mm/ 1 m 10 mm/ 4 m - Definition of laying of the tiles, using which method; - Note the setting time of the tile adhesive; - Cleaning of the tiles after jointing, otherwise jointing material sticks to the tiles and can then only be removed with increased effort; - Install tile (cross-shaped) spacers vertically to the tile plane, they can then be removed easily after the tile adhesive has cured (are then no longer required)	Remove tiling spacers before filling joints;  Spacing of tiles in corners < 5 mm;

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- where possible lay with cross joints or third lap stretcher bond (all tiles have a slight curvature due to the manufacturing process, if laid with stretcher bond the concave and convex sides are opposite each other; - lay large format tiles using the floating-buttering method; - Setting time of the tile adhesive is delayed compared to small format tiles		 Non-uniform hard joints made in the area of the floor inlet.  Jointing material not washed off, tiles not cleaned.

فحص
جودة البناء

Tiling Works

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Tiling work Indoor area Walls and floors	**General information on tiling work**			
	- SBC 1101 Section 905.3 - Accepted engineering practice. - Design documents.	- Floors in toilet rooms and bathroom floors must have a smooth, hard, non-absorbent surface, with at least 15 cm high base tile all around on the walls; - Walls within a radius of 60 cm of urinals and water closets must have a smooth, hard, non-absorbent surface up to a height of 1.2 metres above the floor, materials moisture resistant, Exceptions: 1. Residential units and sleeping units (bedrooms), 2. Toilet rooms, which are not accessible to the public and have no other fixtures than a water closet; - Tiles glazed or unglazed - Note joint widths depending on the tile formats; - Joints in corners and at ends/joints approx. 5 mm wide; - Tile laying tolerances: Sum of the allowable tolerance from trade laying tolerance (1 mm) and material-related dimensional tolerance (depending on the tile format)	- Check the laying tolerances on site (construction site check)	 Joints widths need to be in line with tile format
	Indoor tiling work			
		Tile requirements: - Hard, water repellent surface	- Check manufacturer's certificate / delivery notes; - Comparison with American National Standard Specifications	

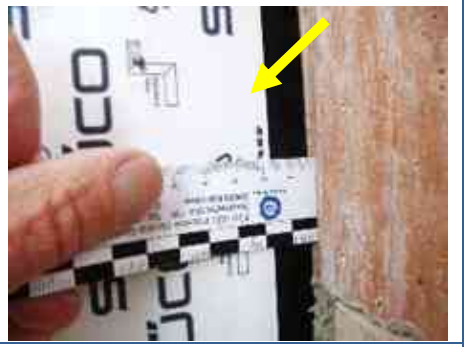
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Tile laying requirements: - Shower partitions and walls above baths with installed shower must be tiled up to a height of 1.80 m above the waste outlet; - the connections between tiles and bath tabs must be watertight; - removal of the tile spacers, creation of a uniform jointing plane; - clean tiles immediately after jointing; - tile distances in corner area approx. 5 cm; - Making of elastic joints in the corner areas and at installations such as bath and pipes; - Make monolithic joints uniformly and almost flush with the surface of the tiles; - where possible lay with cross joints or third lap stretcher bond (all tiles have a slight curvature due to the manufacturing process, if laid with stretcher bond the concave and convex sides are opposite each other	- Check the substrate (evenness and plumbness: Wall finished: 5 mm/ 1 m 7.5 mm/ 2.5 m Floor finished: 4 mm/ 1 m 10 mm/ 4 m - Cleaning of the tiles after jointing, otherwise jointing material sticks to the tiles and can then only be removed with increased effort	 Spacing of tiles in corners < 5 mm;  Jointing material not washed off, tiles not cleaned.
		General joints information: - Type of joint: Bay limiting joint – see screed, mostly with beads; perimeter joint (floor-wall), mostly elastic joints; connecting joints, mostly elastic joints		

8.10 Architectural / Finishing: Windows with glazing, mounting and shutter works

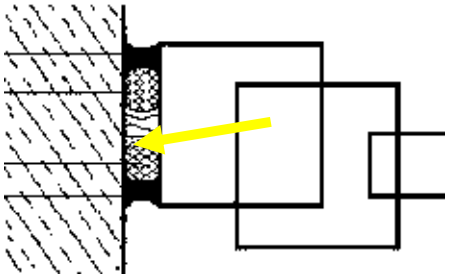
Technical Craft

Windows, glazing and shutter works

Craft	Basis/Standards	Technical functions	Inspection scope	Example
Windows and glazing - uPVC windows - Metal windows - Wooden windows - Glazing	SBC 1101 Section 303 Section 310 Section 312 Manufacturer's instructions	- General	Window elements: - Information about the product used can usually be requested directly from the manufacturer. The product data sheets then - Comparison of the product used (actual) with the due performance (target).	 *Has an approved system been used?*
		- Building physics - Fall protection	Check the properties of the glazing used: - Solar radiation (cardinal direction) - Thermal insulation (u-value) - Summertime thermal insulation (e.g. tinted glass) - Check the fall-protecting properties of the glazing (if required) - Fire protection (if necessary) - Sound insulation (if necessary)	
		Stability (fixing onto the structure)	Fixing of the window frame onto the structure: - Load transfer through support blocks. Arrangement of the support blocks (tilting window, tilt&turn window, sliding door).	 *Support blocks*

Craft	Basis/Standards	Technical functions	Inspection scope	Example
			- Has adequate expansion of the element been taken into consideration? (Reveal / window joint width). The expansion of the window element depends on the material (metal or uPVC windows).	
		Stability (fixing onto the structure)	Fixing of the window frame onto the structure: - Check plumb and horizontal installation of the elements. - Fixing materials (screws, brackets).	 *Fixing materials*  *Distances between screws*

Craft	Basis/Standards	Technical functions	Inspection scope	Example
		Building physics - Thermal insulation - Waterproofing/dampproofing	Insulation of the all-round joint between the window element and the window frame. - The surfaces of the elements (frame and reveal) must be free from foreign materials and dust. - The insulation must fill the joint fully. If PU foam is used, fill the foam completely in the joint. After drying, cut off surplus foam (which protrudes beyond the window frame) flush with the window frame.	 *Insulation of the all-round joint between the window element and the window frame*
		Building physics - Thermal insulation - Waterproofing/dampproofing	- If sound insulation requirements exist, check the joint insulation material for tested sound insulation properties. - If fire protection requirements exist, it is usual to insulate the joint with non-flammable mineral wool.	 *Insulation of the all-round joint NOT complete*

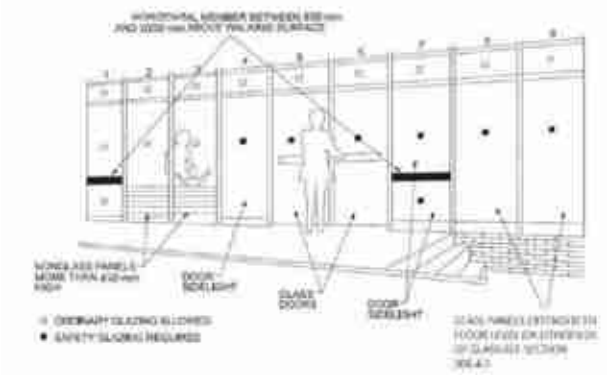
Craft	Basis/Standards	Technical functions	Inspection scope	Example
		Building physics - Thermal insulation - Waterproofing/dampproofing	Inner all-round airtight joint between the window element and the structure - The airtight joint can be made: a) by means of round cord and elastic sealant. The round cord is placed in the joint between the frame and the reveal. The substrate must be dust-free. The joint is then sealed using elastic sealant. b) by means of sealing tapes. The sealing tapes are bonded onto the window frame and the adjacent element. The substrate must be clean and dust-free. Check the adhesion of the tapes. c) by means of plaster keying strips. The plaster keying strips must be suitable for this. The product data sheet must be checked. The plaster keying strips are bonded onto the window frame at the sides and in the upper area	 *Inner all-round airtight joint*  *Check the adhesion of the tapes*
		Building physics - Thermal insulation - Waterproofing/dampproofing	External all-round rain and wind-tight joint between the window element and the structure - the rain and wind-tight joint can be made: a) by means of plaster keying strips. The plaster keying strips must be suitable for this. The product data sheet must be checked. The plaster keying strips are bonded onto the window frame at the sides and in the upper area. In particular, check the joints of the plaster keying strips in the corners for voids. b) by means of laminated sealing tapes. The tapes can be plastered over. The tapes are bonded onto the frame and the adjacent	 *The rain and wind-tight joint*

Craft	Basis/Standards	Technical functions	Inspection scope	Example
			members. Check the tapes for good bonding with the substrate. c) by means of compressible sealing tapes. The tapes are positioned in the joint between the window element/reveal. The tapes must fully fill the joint.	 *Check the tapes for good bonding with the substrate.*
		Function - Turn, tilt, Tilt &Turn function	After completion, check operation of the window elements. - Does the window casement close completely? - Does the window casement open completely? - Does the window casement tilt completely? - Is a safety catch present (turning the window handle when the window is open)?	

Craft	Basis/Standards	Technical functions	Inspection scope	Example
		Safety - Fall protection	In case of full-height window elements with glazing (French doors) without fall-protection function. - Is a railing mounted in front of the window element? - Is the railing sufficiently high to prevent small children from climbing up it? - Do the railing bars have a small space between them, so that small children cannot climb between them?	 *Has the railing a fall-protection function to protect small children?*

Craft	Basis/Standards	Technical functions	Inspection scope	Example
Roller blind / Shutter work	SBC 1101 Section 303 Section 310 Section 312 Manufacturer's instructions	Sub-section 4.4.5 of chapter 4 "Types of Construction" of the Saudi Building Code 201 relates to "Awnings and Canopies" for shading. this deals with retractable coverings (awnings) with a frame, which are all fastened to the building structure. This chapter of the Saudi Building Code 201 is accordingly short. The chapter on awnings and canopies is primarily defined via protective goals. The principal protective goals for awnings and canopies in this chapter are: - Wind loads - Other utilisation loads - Durability / resistant strength / weather resistance - Fire resistance F60 for non-combustible coverings Awnings must have frames made from non-combustible material, fire-retardant timber or type IV timber. The constructions with combustible or non-combustible coverings are either fixed, retractable, folding or collapsible.	Fastening to the building <u>Questions:</u> - Substrate suitable for fastening? - Substrate firm and capable of bearing the load? - Is the shading contractually required? - Can wind loads be withstood? - Are there statements with regard to fire resistance classes for the materials? - Are the frame constructions adequately robust and do they comply with the SBC? - Have fire resistance classes for non-combustible coverings been complied with? - Functional checks carried out for retractable/folding canopies? - Wind monitors present?	 Example of fabric shading for car parking bays   Shading of glass extensions

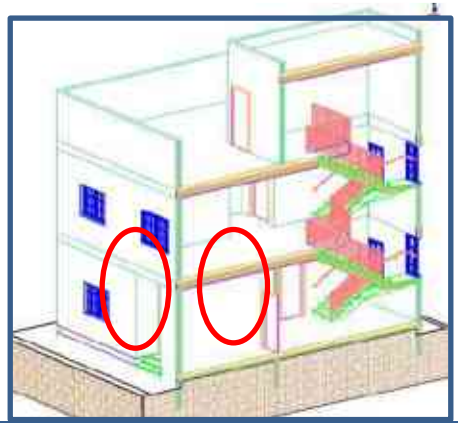
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
SBC 1101 Section 308	**Glazing in windows:** Glazing in an individual fixed or operable panel that meets **all of the following** conditions shall be considered to be a **hazardous location**: 1) The exposed area of an individual pane is **larger than 0.85 m²**, 2) The bottom edge of the glazing **is less than 450 mm** above the floor, 3) The top edge of the glazing **is more than 900 mm** above the floor; and 4) One or more walking surfaces are **within 900 mm**, measured horizontally and in a straight line, of the glazing. **<u>Exceptions:</u>** 1) Decorative glazing. 2) Where a **horizontal rail** is installed on the **accessible side**(s) of the glazing **850 to 950 mm** above the walking surface. The rail shall be capable of withstanding a horizontal **load of 730 N/m without contacting the glass** and have a cross-sectional height of **not less than 38 mm.** 3) Outboard panes in insulating glass units and other multiple glazed panels where the bottom edge of the glass is 7500 mm or more above grade, a roof, walking surfaces or other horizontal [within 45 degrees of horizontal] surface adjacent to the glass exterior.	• Is window glazing installed in hazardous location, a saftey glass? • Is window glazing a decorative glazing? • Is a horizontal rail is installed on the accessible side(s) of the window glazing 850 to 950 mm above the walking surface? • Is the safety glass tested in accordance with CPSC 16 CFR 1201 or ANSI Z97.1? • Is the manufacturer's designation and identification of glazing provided on each pane of glazing?	If the glazing is intalled in **hazardous location, t**hen the glazing must be **Saftey Glass**. What is a Saftey Glass? Is glazing that can pass "Impact test" where glazing shall be tested in accordance with: 1) **CPSC 16 CFR 1201** or **2) ANSI Z97.1** **NOTE:** Glazing in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers **shall not** be permitted to be tested in accordance with ANSI Z97.1 **Identificatio**n: Each pane of glazing installed in **hazardous locations** as defined **below** shall be provided with: • a manufacturer's designation • specifying who applied the designation, • designating the type of glass and • the safety glazing standard with which it complies, which is visible in the final installation. The designation shall be: • acid etched, • sand-blasted, • ceramic-fired, • laser etched, • embossed, or • be of a type that once applied cannot be removed without being destroyed. A label shall be permitted in lieu of the manufacturer's designation.

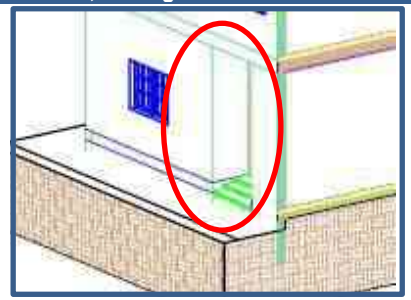
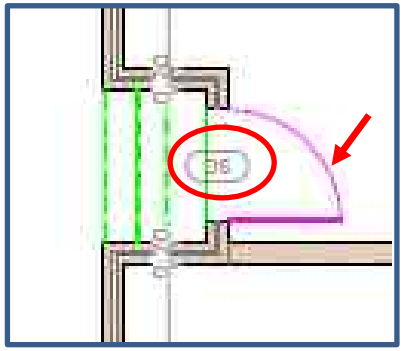
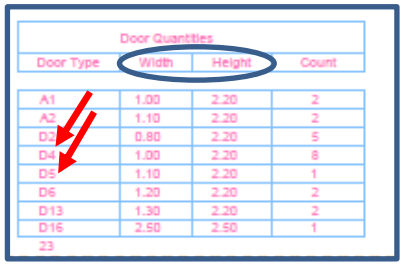
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1101, page 208)

8.11 Architectural / Finishing: Doors – Wood and Metal

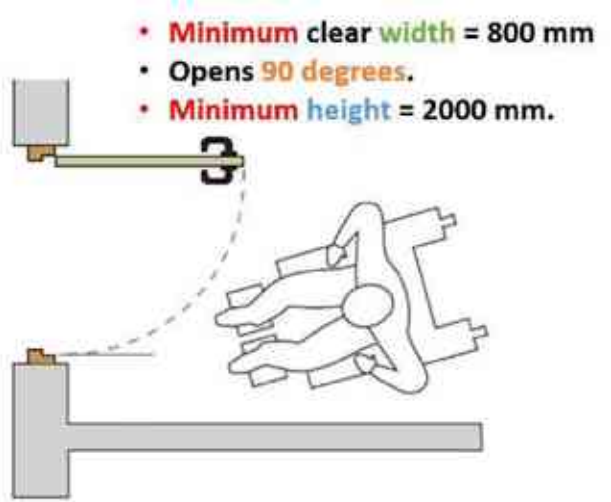
Technical Craft

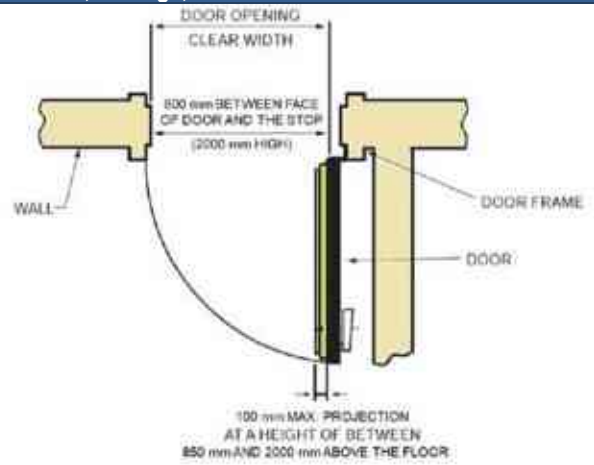
Doors – Wood and Metal

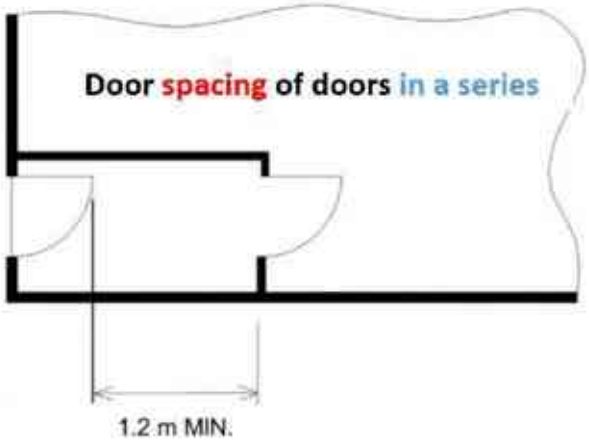
Craft	Basis / Standards	Technical functions	Inspection scope	Defects, findings and notes
Carpentry work - doors / metal doors / hardware work	SBC 1101 Section 311 SBC 201 Section 1010	SBC 1101 covers doors from a detached house (one-family dwellings) to multiple dwelling buildings through to public buildings and industrial buildings. The protection objectives and requirements for doors are generally very different due to the large scope covered. The **housing construction** aspects of carpentry work doors / metal doors / hardware are covered here.	The following structural situations generally occur in housing with regard to doors: Front door of a detached house (single dwelling) Front door of a multiple occupancy dwelling Apartment door in a multiple occupancy dwelling General interior doors (detached house/multiple occupancy dwelling) Metal doors (e.g. between living space and usable space). Based on the design, the requirements and any official constraints on the door systems must be known and checked: <u>By way of example in housing:</u> - Simple front door? - Simple interior door? - Fire protection requirements? - Sound insulation requirements? - Visual installation requirements? - Security door? - Door hardware requirements? - Material selection requirements? - etc.	  

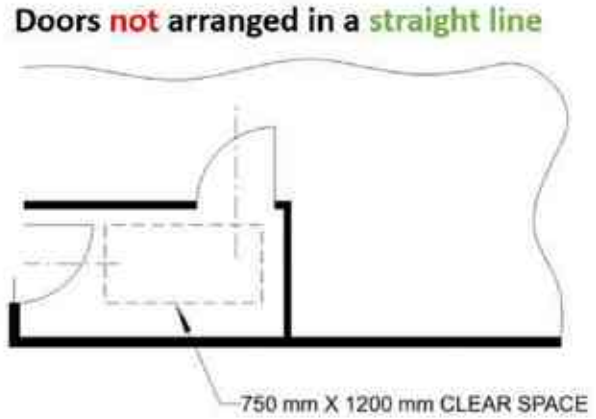
Craft	Basis / Standards	Technical functions	Inspection scope	Defects, findings and notes
Carpentry work - doors / metal doors / hardware work	SBC 1101 Section 311 SBC 201 Section 1010	See above	<u>Basic questions on the contractually due quality of front doors / interior doors in housing:</u> <u>Questions regarding door dimensions:</u> - Do the door designations and dimensions (width and height?) match the design and the minimum requirements of the SBC? <u>Accessibility questions:</u> - Do requirements exist for accessible entrances / clear opening widths? - Do door sill requirements exist? <u>Questions regarding opening directions (left or right-hung):</u> - Are the opening directions correct (left-hung / right-hung) taken into account / in exit doors? - Are construction joints in the screed arranged so that they are concealed under the door leaves? <u>Questions on choice of materials:</u> - Have the doors been delivered and installed with the correct material properties (wood / plastic / metal / glass, ...)?	   Door Quantities Door Type / Width / Height / Count A1 1.00 2.20 2 A2 1.10 2.20 2 D2 0.80 2.20 5 D4 1.00 2.20 8 D5 1.10 2.20 1 D6 1.20 2.20 2 D13 1.30 2.20 2 D16 2.50 2.50 1 23 *Choice of materials as per plans*

Craft	Basis / Standards	Technical functions	Inspection scope	Defects, findings and notes
Carpentry work - doors / metal doors / hardware work	SBC 1101 Section 311 SBC 201 00Section 1010	see above	Building physics questions:Ventilation: - If damp air is extracted from domestic bathrooms – do the interior doors have an undercut or ventilation screens? - Is the undercut / the ventilation screen adequately dimensioned? Fire protection: - Fire protection requirements can exist for doors. Fire and smoke control doors are installed to prevent the spread of fire and smoke within a building for a certain period of time. - Have fire doors with appropriate requirements profile been installed? There are different quality levels. - Are appropriate markings and information signs present on the doors? - Are, for example, metal doors with fire protection requirements installed between living areas and garages? - Are the metal frame joints solidly filled with mortar? - Do the metal doors have an overall paint finish? Technical / visual standards: - Have the doors been adequately installed? - Do special requirements exist for the installation? - Are frames, door linings and the doors themselves installed plumb? - Do the doors drag across the floor? - Do the doors close automatically? - Do door linings touch the walls? - Are the entire doors free from damage? - Can the doors be locked? - Are door gaskets inserted? - Do the doors correspond to the contractually due quality?	

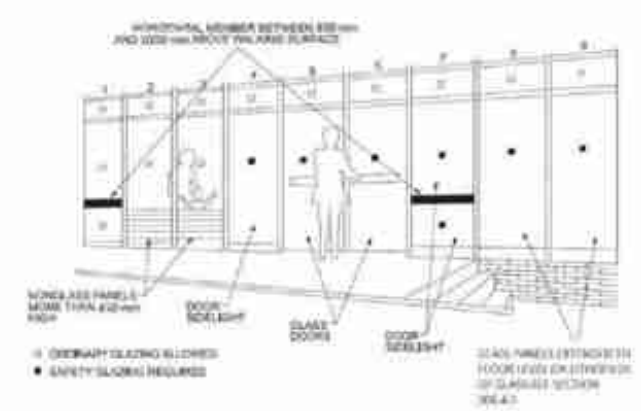
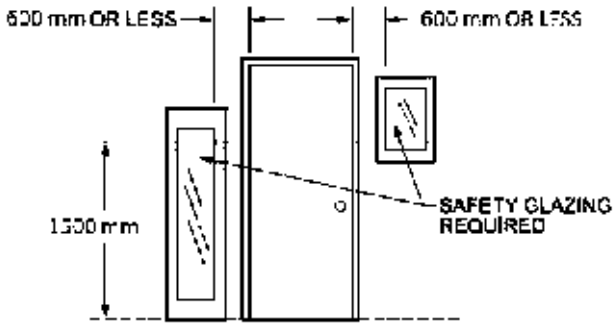
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Door Requirements **SBC 201** **Section 1010**	**Door Dimensions**		
	Size of doors: The minimum **clear width** of each door opening shall be **800 mm** with the door open **90 degrees**. The **height** of door openings shall be **not less than 2000 mm.** **Why the minimum clear width of 800 mm?** The minimum clear width in a doorway of **800 mm** is to: 1) Allow passage of a wheelchair 2) As well as persons utilizing walking devices or 3) Other support apparatus. Similarly, because of the difficulties that a person with physical disabilities would have in opening a pair of doors simultaneously, the 800 mm minimum must be provided by a single door leaf.	• Is the door dimensions less than 800 mm in clear depth, and less than 2000 mm in clear height? • Does the door open less than 90 degree?	
	Projections into clear width and clear height		
	• There shall not be **projections** into the required clear width lower than **850 mm** above the floor or ground. • Projections into the clear opening width between 850 mm and 2000 mm above the floor or ground shall **not exceed 100 mm.**	• Do the projections into the clear opening width between 850 mm and 2000 mm above the floor or ground? • Do the projections into the clear opening width exceed 100 mm?	

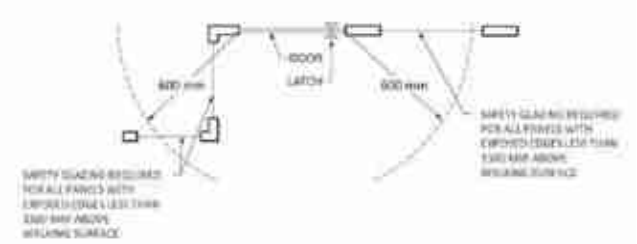
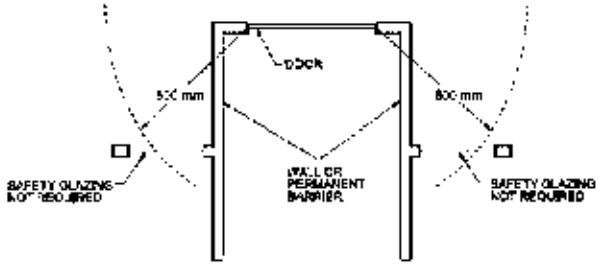
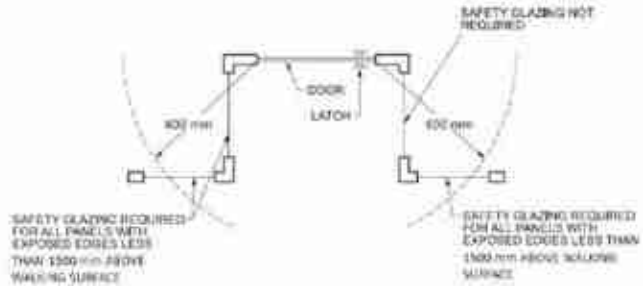
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• Exception: Door closers and doorstops shall be permitted to be 2000 mm minimum above the floor. **Thresholds:** Thresholds at doorways **shall not exceed 13 mm** in **height** above the finished floor or landing for sliding doors. A threshold is: a) A potential **tripping hazard** and b) A **barrier to accessibility** by people with mobility impairments. For these reasons, thresholds for all doorways are to be a maximum of **13 mm high**.	• Do thresholds at doorways exceed 13 mm in height above the finished floor or landing for sliding doors?	 (Copy from SBC 201, page 1153) 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Door Space arrangement		
	Door space arrangement between two doors in a series shall be **1200 mm** minimum **plus** the **width** of a **door swinging** into the space. Doors in a series shall **swing** either: • In the same direction or • Away from the space between the doors. Where doors in a series are **not** arranged in **a straight line**, the space between doors should provide sufficient clear space for a wheelchair [**750 mm by 1200 mm]** beyond the arc of the door swing. **Why?** To facilitate accessibility and to provide sufficient space to enable occupants to negotiate the second door without being encumbered by the first door's swing arc.	• Does the door space arrangement between two doors in a series less than 1200 mm? (measured from the width of a door swinging into the space) • Does the space between doors provides sufficient clear space for a wheelchair?	 (Copy from SBC 201, page 1158)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy from SBC 201, page 1158)
	Bathroom doors		
	Bathroom doors that latch in the closed position shall be capable of being unlocked **from the outside**. **Why?** In case a someone needs assistance in a bathroom, the bathroom door must have a type of hardware that would allow the door to be unlocked from the outside	• Are bathroom doors capable of being unlocked **from the outside?**	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Glazing in doors **SBC 1101** **Section 308**	**Glazing in doors**		
	Glazing in fixed and operable panels of: • Swinging, • Sliding and • Bifold doors shall be considered to be a **hazardous location.** **Exceptions**: 1) Glazed openings of a size through which a **75 mm diameter sphere** is unable to pass. 2) Decorative glazing. The CPSC standard requires the installation of **safety glazing materials** meeting 16 CFR, Part 1201 only in storm doors, combination doors, entrance-exit doors, sliding patio doors, closet doors, and shower and tub doors and enclosures.	• Is glazing in doors a safety glass? • Does door glazing comply with CPSC 16 CFR 1201? • Does a 75 mm diameter sphere pass through the glazed openings in the door? • Is the door glazing a decorative glazing? • Is the manufacturer's designation and identification of glazing provided on each pane of glazing?	If the glazing is intalled in **hazardous location, t**hen the glazing must be **Saftey Glass**. What is a Saftey Glass? Is glazing that can pass "Impact test" where glazing shall be tested in accordance with: 3) **CPSC 16 CFR 1201** or **4) ANSI Z97.1** **NOTE:** Glazing in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers **shall not** be permitted to be tested in accordance with ANSI Z97.1 **Identificatio**n: Each pane of glazing installed in **hazardous locations** as defined **below** shall be provided with: • a manufacturer's designation • specifying who applied the designation, • designating the type of glass and • the safety glazing standard with which it complies, which is visible in the final installation. The designation shall be: • acid etched, • sand-blasted, • ceramic-fired, • laser etched, • embossed, or • be of a type that once applied cannot be removed without being destroyed. A label shall be permitted in lieu of the manufacturer's designation.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1101, page 208)
	Glazing adjacent to doors.		
	Glazing in an individual fixed or operable panel **adjacent to a door** shall be considered to be a **hazardous location** where the **bottom exposed edge** of the glazing **is less than 1500 mm** above: a) The floor or b) Walking surface and it meets **either of the following** conditions: **1)** Where the glazing is **within 600 mm** of either side of the door in the plane of the door in **a closed position.** 2) Where the glazing is on a wall **perpendicular** to the plane of the door in a **closed position** and **within 600 mm of the hinge side** of an in-swinging door.	• Does glazing panel adjacent to a door a safety glass? • Does glazing panel adjacent to a door a comply with the code requirements? • Does door glazing comply with CPSC 16 CFR 1201? • Is the manufacturer's designation and identification of glazing provided on each pane of glazing?	

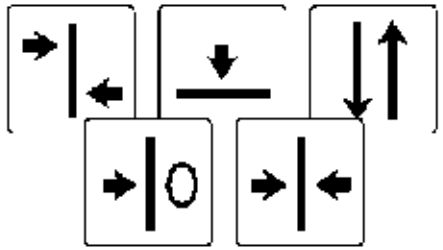
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Exceptions: 1) Decorative glazing. 2) Where there is an intervening wall or other permanent barrier between the door and the glazing. 3) Where access through the door is to a closet or storage area 900 mm or less in depth. 4) Glazing that is adjacent to the fixed panel of patio doors.		   (Copy SBC 1101, page 209 & 210)

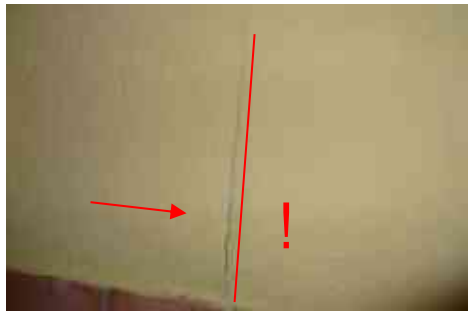
8.12 Painting and paperhanging works

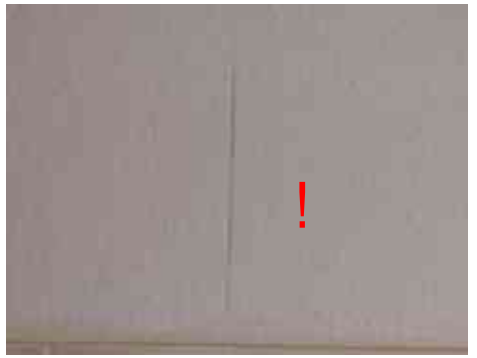
Technical Craft

Paperhanging / Wallpapering

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Painting works Walls and ceilings	**General information pertaining to painting work**			
	SBC 201 Section 803 Manufacturer's instructions Planning documents	Requirements for the painting work: - Creation of an exterior that is watertight against driving rain - Rust protection for steel components - The painting work shall be determined on the basis of durability and service life		
	Implementation of the painting work			
		Requirements for the substrate: - Substrate must be stable and absorbent - The surface must be free of any layers that would reduce the adhesion of the paint - The substrate must comply with the smoothness requirements of the coating - Ridges, cavities, cracks and imperfections must be rectified.	- If necessary, carry out wetting test with water to assess the absorption characteristics - If necessary and agreed by the owner, check the existing old paint layer beforehand by means of scratch test, cross cutting test or adhesive tape test to check the surface stability.	
		Preparatory work: - Checking the substrate (old plaster, new plaster) - If stability is inadequate, prime using deep primer - Remove rust from steel substrate or clean - Sand wooden substrate and rectify loose material - Bridge over the Stucanet installation slots with oiled paper or metal mesh (fasten to the masonry on both sides of the slot)	- Visual check of the substrate (level, crack formation)	

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Install corner protection rails and, if necessary, plaster depth guide strips in the bathrooms, plumb and flush -		
Wallpapering work - Surface evenness - Visual appearance - Fire behaviour	**Preparations for wallpapering work**			
	SBC 201 Section 803 Manufacturer's instructions Planning documents Contractual documents	Visual appearance	Material selection - Is the wall/ceiling covering (wallpaper, non-woven) to be laid with a pattern? Does the wall/ceiling covering (wallpaper, non-woven) have a repeating pattern (pattern offset)?	 *Does the wall/ceiling covering have a repeating pattern?*
	Installation Wall/ceiling covering (wallpaper, non-woven, paint)			
	Suitability for use	- Assurance of durability - Visual appearance	Material selection - Should elastic connection joints be implemented with suitable joint material (that can be painted over)? Silicone cannot be painted over, use acrylic / painters' acrylic	 *Eastic connection joints*

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 201 Section 803 Manufacturer's instructions Planning Construction experience	**Defect**	**Effect**	
		Substrate too damp	- Adhesive / paint will not bond - Wall/ceiling covering (wallpaper, non-woven) not bonded to the substrate	
		Substrate too absorbent	- Adhesive dries out too quickly and does not achieve its strength / bonding force - Wall/ceiling covering (wallpaper, non-woven, paint) not bonded to the substrate - Obvious gaps in joints between wall/ceiling covering (wallpaper, non-woven) strips	 *Obvious gaps in joints between wall/ceiling covering*

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Substrate crack formation	- Are there creases or cracks forming in the wall/ceiling covering (wallpaper, non-woven, paint)? - Straight crack formation – expansion joints in the substrate bonded over / covered	
		Application mistakes Visual impairment of pattern / strips	- Have the wall covering strips been applied with tight and discrete joints? - Too wide / yawning joints between neighbouring wall/ceiling covering (wallpaper, non-woven) strips obvious from a 2 m viewing distance?	

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Application mistakes Trimming	- Trimming work around installations (flush-mounted boxes for electrical fittings) carried out with precision? - Trimming work around neighbouring components (walls, columns, windows) carried out with precision?	

8.13 Architectural / Finishing: Metall works

Technical Craft

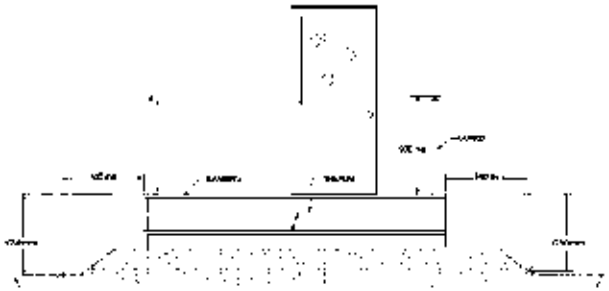
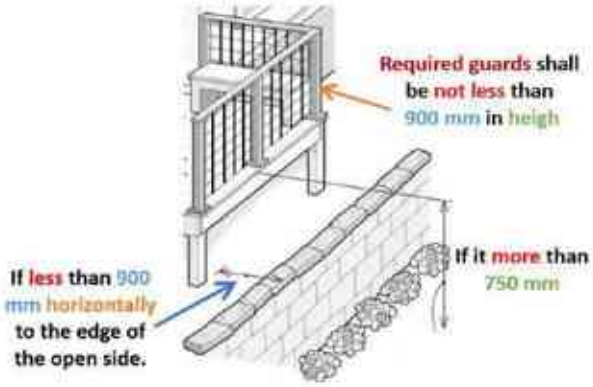
Metal structure works

Craft	Basis/Standards	Technical functions	Inspection scope	Defects, finding and notes
Metal structure works (in residential construction)	SBC 1101 Section 308 Section 310 Section 312	the SBC 1101 is oriented more towards civil engineering and industrial construction rather than conventional residential construction. As a result, is only partially applicable for residential construction. "Stairways and Handrails", for example, metal is not specifically mentioned or highlighted as a construction material. For example, it is only stipulated here that the stairways and handrails must be safe and securely erected. Because metal is also used for the construction of handrails in residential construction, protective goals such as strength and durability must also be complied with as a minimum. Visual requirements are also important.	In general, metal (construction steel) is a very strong construction material. As a result it is used in areas where stability and strength are required, also in conjunction with other construction materials. - Is there a static calculation for the component available? - Is the metal type or steel type correct? - Are the dimensions/dimensioning correct? - Is there is a design feature to assure correct positioning? - Is the load bearing capacity assured? - Are the supports pressure-resistant? - Have the correct connectors been selected? - Has corresponding corrosion protection been established (zinc plating / corrosion-protection coating)? - Are there requirements for fire protection? Must the steel construction components be protected from thermal influences? - Weld seams correctly implemented? - Are there requirements for the processing of weld seams in visible areas? - Are shape changes possible due to changes in temperature / expansion joints? - Are there requirements for noise, heat or moisture protection?	  

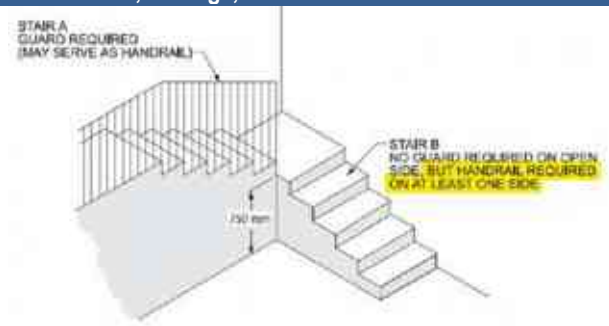
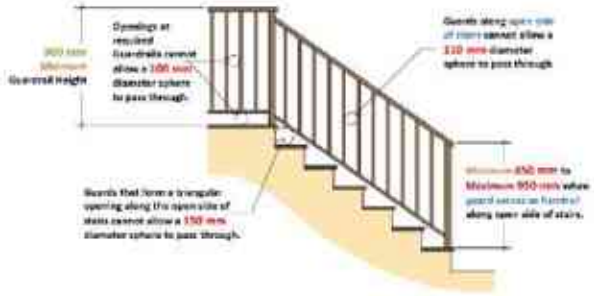
Craft	Basis/Standards	Technical functions	Inspection scope	Defects, finding and notes
Metal structure works (in residential construction)	SBC 1101 Section 308 Section 310 Section 312	See above	Use on balconies and roof terraces - - Are railings secured against being climbed over, e.g. by means of panels being fitted in the inside in the case of horizontal railing struts? - Must railing struts be fitted vertically? - Handrail configured inwards? - Is the load bearing capacity assured? - Have the connection areas been implemented with the correct connecting materials? - Is stainless steel necessary (e.g. when used in coastal areas with salt air)? Use in stairwells - Are the dimensions / dimensioning / height of the railings correct? Distances to stairwell shaft ≤ 6 cm? - Are railings secured against being climbed over, e.g. by means of panels being fitted in the inside in the case of horizontal railing struts? - Must railing struts be fitted vertically? - Is the load bearing capacity assured? - Handrails fitted?	  

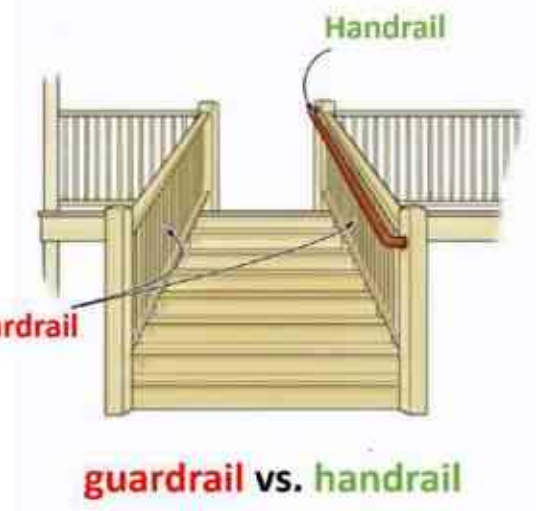
Craft	Basis/Standards	Technical functions	Inspection scope	Defects, finding and notes
Metal structure works (in residential construction)		See above	- Openings too large? Can a cube with 15 cm edge length pass through the structure?	  

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

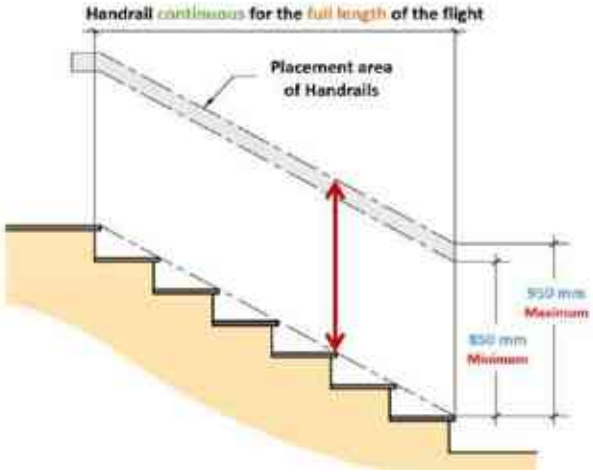
GUARDS AND WINDOW FALL PROTECTION
 	
SBC 1101 SECTION 312 SECTION 308
	GUARDS
	
	The guard provisions address the issue of protecting occupants from **falling from any type of elevated walking surface**.
	
	Stairs, ramps, and landings as **examples** of open-sided walking surfaces, but this is **not an all-inclusive** list of locations where **guards are required.**
	
	Guards:
	Guards shall be located along:
	• open-sided walking surfaces, including:
	  ○ stairs,
	  ○ porches,
	  ○ balconies
	  ○ ramps,
	  ○ landings and
	  ○ swimming pools
	• that are located **mor than 750 mm** measured **vertically** to the floor or grade below.
	• at any point within **900 mm horizontally** to the edge of the open side.
	
	Insect screening shall **not** be considered as a guard.
	
	Required guards Height:
	Required guards shall be **not less than 900 mm** in height as measured vertically above the **adjacent walking surface** or the line connecting the leading edges of the treads.
	
	Guard serves as a handrail:
	Where the top of the guard serves as a handrail on the open sides of stairs, the top of the guard shall be **not less than 850 mm and not more**
		• Are guards located along all open-sided walking surfaces that are located mor than 750 mm measured vertically to the floor or grade below?
		• Is Insect screening used as a guard?
		
		• Is the guard height less than 900 mm as measured vertically above the adjacent walking surface?
		
		• Are the top of the guard serves as a handrail less than 850 mm and not more than 950 mm as measured vertically from a line connecting the leading edges of the treads?
		• Are the guard openings allow passage of a sphere 100 mm/110 mm in diameter?
		
		• Are the triangular openings at the open side of stair allow passage of a sphere 150 mm in diameter?
		• Is plastic composite exterior guards comply with ASTM D7032?
		• Is glazing in guards above a walking surface a safety glass?
		• Is the safety glass tested in accordance with CPSC 16 CFR 1201 or ANSI Z97.1?
		• Is the manufacturer's designation and identification of glazing provided on each pane of glazing?
			
			(Copy SBC 1101, page 222)
			
			 

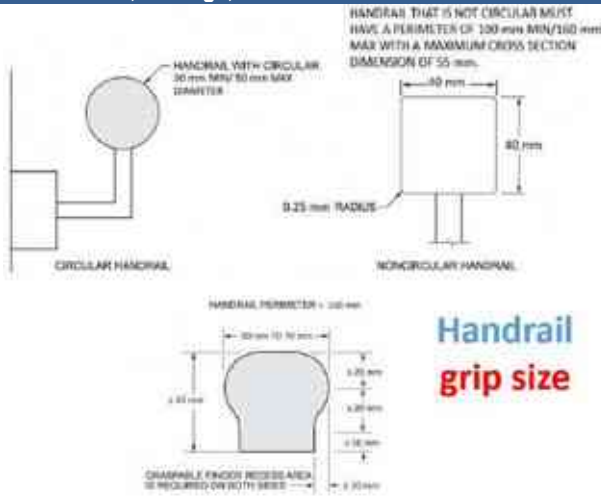
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

	than 950 mm as measured vertically from a line connecting the **leading edges of the treads.**
	
	Opening limitations:
	Guards must be constructed so that they prohibit smaller occupants, **such as children**, from falling through them.
	
	• Required guards shall not have openings from the walking surface to the required guard height that allow passage of a sphere **100 mm** in diameter. (for guards **on** the **open side of stairs** a sphere **110 mm** in diameter).
	• The triangular openings at the open side of stair, formed by the riser, tread and bottom rail of a guard, shall not allow passage of **a sphere 150 mm in diameter.**
	
	Exterior plastic composite guards:
	Plastic composite exterior guards shall:
	1. comply with **ASTM D7032**,
	2. the general requirements for guards in this section.
	
	Glazing in guards:
	• Glazing in guards above a walking surface **shall be** Considered to be a **hazardous location.**
	• Glazing shall be tested in accordance with **CPSC 16 CFR 1201** or **ANSI Z97.1**
	• Glazing shall be provided with:
	  • a manufacturer's designation
	  • specifying who applied the designation,
	  • designating the type of glass and
	  • The safety glazing standard with which it complies, which is visible in the final installation
			
			(Copy SBC 1101, page 222)
			
			 

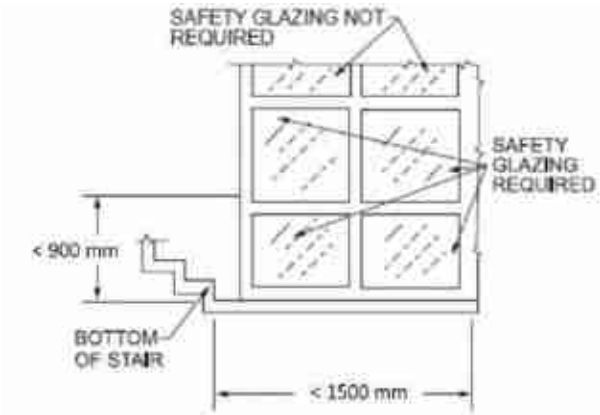
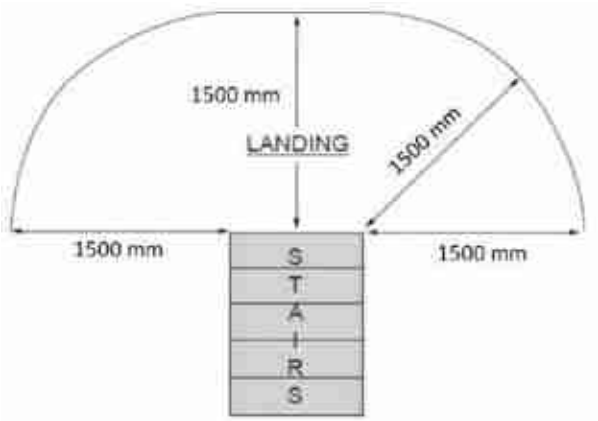
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	The designation shall be: • acid etched, • sand-blasted, • ceramic-fired, • laser etched, • embossed, or • be of a type that once applied cannot be removed without being destroyed. A label shall be permitted in lieu of the manufacturer's designation.		 • Guards and handrails often coexist in the same assembly, but they **serve different jobs.** • Guards have only one purpose: They stand as a **barrier** at the edge of raised walking surfaces to reduce the possibility of an **accidental fall**. • Handrails serve a quite different role: It is intended for **grasping by the hand** by an occupant for **guidance or support** while traversing an obstacle, such as a stairway or ramp.

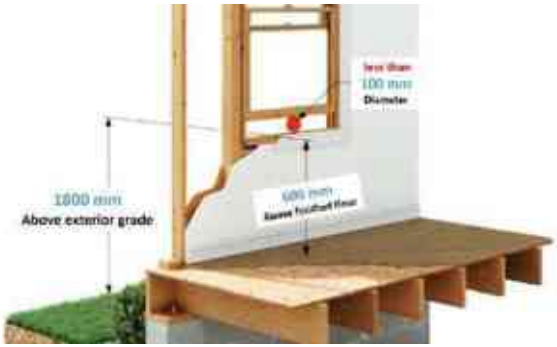
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Horizontal bars are not allowed in guards (can be used as ladder by children)  Glazing manufacturer's designation

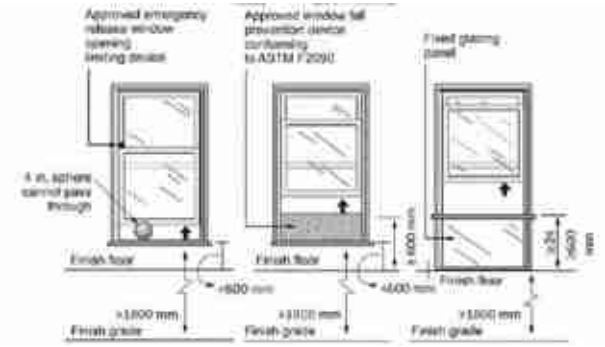
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Handrails:		
	Handrails: The provision of handrails increases the level of **safety** when used by the occupant's while **ascending and descending stairs**. Handrails are used for guidance, stabilization, pulling and to assist in arresting a fall. Handrails shall be: • provided on not less than **one side** of each continuous run of treads or flight • with **four or more risers**. • Handrail **height**, measured vertically from the sloped plane adjoining the tread nosing, or finish surface of ramp slope, shall not be less than **850 mm** and not more than **950 mm.** • Handrails for stairways shall be **continuous** for the full length of the flight, from a point directly above the top riser of the flight to a point directly above the lowest riser of the flight. For handrail **grip size** requirements refer to **Section 311.7.8.3 of SBC 1101**.	• Is the handrail height less than 850 mm and not more than 950 mm? • Is the handrail continuous for the full length of the flight? • Is the handrail grip size comply with the requirements of Section 311.7.8.3 of SBC 1101?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1101, page 219)
	Glazing adjacent to stairs, ramps, and **bottom stair landing**		
	Glazing adjacent to stairs and ramps: Glazing where the **bottom exposed edge** of the glazing **is less than 900 mm** above the plane of the adjacent walking surface of stairways, landings between flights of stairs and ramps shall be considered to be a **hazardous location.** **Exceptions**: 1) Where a rail is installed on the accessible side(s) of the glazing 850 to 950 mm above the walking surface. The rail shall be capable of withstanding a horizontal load of 730 N/m without contacting the glass and have a cross-sectional height of not less than 38 mm. 2) Glazing **900 mm** or more measured **horizontally** from the walking surface.	• Is glazing adjacent to stairs and ramps a safety glass? • Is glazing adjacent to the landing at the bottom of a stairway a safety glass? • Is the safety glass tested in accordance with CPSC 16 CFR 1201 or ANSI Z97.1? • Is the manufacturer's designation and identification of glazing provided on each pane of glazing?	If the glazing is intalled in **hazardous location, t**hen the glazing must be **Saftey Glass**. What is a Saftey Glass? Is glazing that can pass "Impact test" where glazing shall be tested in accordance with: 5) **CPSC 16 CFR 1201** or **6) ANSI Z97.1** **NOTE:** Glazing in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers **shall not** be permitted to be tested in accordance with ANSI Z97.1 **Identificatio**n:

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Glazing adjacent to the bottom stair Landing: Glazing adjacent to the landing at the **bottom of a stairway** where the glazing **is less than 900 mm** above the landing and **within a 1500 mm horizontal arc less than 180 degrees** from the bottom tread nosing shall be considered to be a **hazardous location**. **Exception**: The glazing is protected by a guard complying with SECTION 312 of SBC 1101 and the plane of the glass **is more than 450 mm** from the guard.		Each pane of glazing installed in **hazardous locations** as defined **below** shall be provided with: • a manufacturer's designation • specifying who applied the designation, • designating the type of glass and • the safety glazing standard with which it complies, which is visible in the final installation. The designation shall be: • acid etched, • sand-blasted, • ceramic-fired, • laser etched, • embossed, or • be of a type that once applied cannot be removed without being destroyed. A label shall be permitted in lieu of the manufacturer's designation.  (Copy SBC 1101, page 211)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			  (Copy SBC 1101, page 212)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Windows fall protection:		
	Windows fall protection: The intent of these provisions is to prevent **small** children from falling out of open windows. An **opening control device** installed on any window must have an **emergency release device** that is clearly identified and that **operates without the need** for: • a key, • tool or • special knowledge. These operation criteria match the language in the provisions for emergency escape and rescue openings. Windows fall protection is **only required** for windows that **meet all the following** conditions: 1. Are **operable**, 2. Are located more than **1800 mm** above **finished grade** or another exterior surface below, and 3. Have a **sill height** of less than **600 mm**, as measured vertically from the floor surface of the room in which they are located. Where a window meets **all of three above conditions**, it shall comply with **at least one** of the following: 1. Have openings which will not allow passage of a **100 mm-diameter sphere,** 2. Be equipped with a **window fall prevention device** in accordance with **ASTM F2090**, or 3. Be equipped with **opening control devices** in accordance with shall comply with **ASTM F2090.**	• Are the opening control devices installed on windows have an emergency release device that complies with ASTM F2090? • Is windows fall protection required? • Is windows fall protection installed?	 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Window opening control devices: • Window opening control devices shall comply with ASTM F2090. • The window opening control device, **after operation to release the control device** allowing the window to fully open, shall not reduce the net clear opening area of the window unit to less than the area required by **Emergency and escape rescue openings** (Section 310.2.1 of SBC 1101).		 (Copy SBC 1101, page 223) **The area required by Emergency and escape rescue openings: (**Section 310.2.1 of SBC 1101): Emergency and escape rescue openings shall have: ○ Net clear **opening** of not less than **0.53 m²**. ○ Net clear **height** of not less than **600 mm.** ○ Net clear **width** of not less than **500 mm.** ○ **Windowsill height** of not more than **1100 mm** above the floor.

8.14 Mechanical / Electrical / Plumbing: HVAC-systems

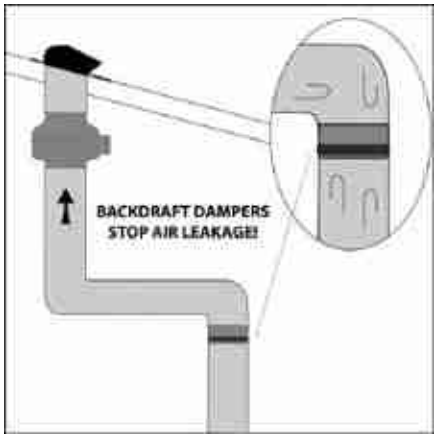
Technical Craft

HVAC – Systems (Ventilation and Airconditioning)

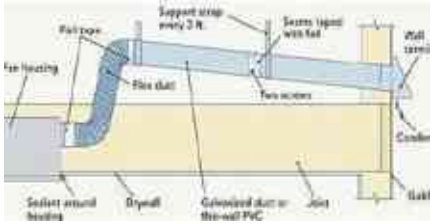
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Ventialtion and Air Conditioning Systems (in new residential buildings to be built)				
Basic principles	SBC 1102 Section 1505 Section 1506 Section 1507	For pipe connection and switching device requirements storm drainage systems For washroom and toilet room ventilation requirements		 ***Ventlation systems***
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Ability to inspect and unobstructed access to the central components	
			Adequate structural design and load-bearing capacity of the installation areas of the central components, for example, central ventilation equipment, split air-conditioning external units, etc.	 ***Split A/C***

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			Safe disconnection of the power supply of the electrically operated components (fans, heaters, pumps, etc.), for example, by means of repair switch	 *Repair switch*
Working basis	Construction documents	Floor plans, sections, schematic diagrams, details, sound insulation requirements, fire protection	Check and document the completeness of the documents	
	Descriptions	System and function descriptions, material definitions, bill of quantities	Check and document the completeness of the documents	
	Proofs/verifications	Air flow rates (planned / actual comparison), cleaning of the duct network and central components, functional verification of the central components in partial and full-load operation, operating, maintenance and servicing instructions of the manufacturers	Check and document the completeness of the documents	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Focal areas of the ventilation inspections				
Space ventilation Necessity	SBC 1102 Section 1505 Section 1506 Section 1507	*Ventilation shall be provided during the periods that the room or space is occupied.* Protection objective: Space ventilation during use		 ***Ventilation system***
External air intake openings and exhaust air outlets Layout	SBC 1102 Section 1505 Section 1506 Section 1507	*Opening location. Outside air exhaust and intake openings shall be located a minimum of 3 meter from lot lines or buildings on the same lot. Where openings front on a street or public way, the distance shall be measured to the centerline of the street or public way.* *Intake openings. Mechanical and gravity outside air intake openings, shall be located a min. of 3 m from any hazardous contaminant such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in these requirements. Where a source of contaminant is located within 3 m of an intake opening, such opening shall be located a minimum of 0.6 m below the contaminant source.* Protection objective: - Minimisation of the impairment of drawn-in outdoor (ambient) air. Minimisation of negative effects on third persons due to exhaust air.		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
External air intake openings and exhaust air outlets Opening protection	SBC 1102 Section 1505 Section 1506 Section 1507	***Outdoor opening protection.*** *Air exhaust and intake openings that terminate outdoors shall be protected with corrosion-resistant screens, louvers or grilles. Openings in louvers, grilles and screens shall be sized in accordance with Table 2.1.6, and shall be protected against local weather conditions. Outdoor air exhaust and intake openings located in exterior walls shall meet the provisions for exterior wall opening protective in accordance with the Saudi Building Code Basic Regulations.* Protection objective: Prevention of the penetration of foreign bodies in outdoor and exhaust air openings.		 *Outdoor opening protection*
Minimum ventilation area for natural ventilation	SBC 1101 Section 303	***Ventilation area required.*** *The minimum openable area to the outdoors shall be 4 percent of the floor area being ventilated.* Protection objective: Adequate natural space ventilation		
Minimum ventilation area for natural ventilation for adjacent rooms	SBC 1101 Section 303	***Adjoining spaces.*** *Where rooms and spaces without openings to the outdoors are ventilated through an adjoining room, the opening to the adjoining rooms shall be unobstructed and shall have an area not less than 8 percent of the floor area of the interior room or space, but not less than 2.3 square meters. The minimum openable area to the outdoors shall be based on the total floor area being ventilated.* Protection objective:		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Adequate natural space ventilation		
Supply and extract air Equal air flow rate balance	SBC 1102 Section 1505 Section 1506 Section 1507	***Ventilation system.*** *Mechanical ventilation shall be provided by a method of supply air and return or exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with Chapter 4. Ventilation supply systems shall be designed to deliver the required rate of supply air to the occupied zone within an occupied space. The occupied zone shall have boundaries measured at 75 mm. and 1.8 m above the floor and 600 mm from the enclosing walls.* Protection objective: - Minimisation of overpressure and underpressure within the rooms to be ventilated. Minimisation of air transfer or air inflow into or from the outdoor area.		
ventilation network Comparison	SBC 1102 Section 1505 Section 1506 Section 1507	***Balancing.*** *Ventilation systems shall be balanced by an approved method. Such balancing shall verify that the ventilation system is capable of supplying the airflow rates required by Section 2.3.* Protection objective: Prevention of over or under supply of rooms to be ventilated.	- Check by way of example and document, whether the designed target air quantities approximately correspond to the executed actual air quantities, for example, based on the ventilation diagram Check whether, for example, flow controllers have been executed.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Space ventilation and air conditioning systems control	SBC 1102 Section 1505 Section 1506 Section 1507	*General. Mechanical ventilation systems shall be provided with manual or automatic controls that will operate such systems whenever the spaces are occupied. Airconditioning systems that supply required ventilation air shall be provided with controls designed to automatically maintain the required outdoor air supply rate during occupancy.* Protection objective: Change in space air states by the user.	- Check by way of example and document, whether equipment (for example: room thermostats, switch or control units, etc.) is executed for operation of the space ventilation or air conditioning system.	
Air ducts Laying		***Slope**. Ducts shall slope to allow drainage to a point provided with access.* Protection objective: Discharge of water within air ducts laid underground	- Check by way of example and document, whether air ducts laid underground are laid with gradient towards the drainage.	 *Ducts shall slope to allow drainage to a point provided with access*
Air ducts Connections		***Joints, seams and connections.** All longitudinal and transverse joints, seams and connections in metallic and nonmetallic ducts shall be constructed as specified in (SMACNA HVAC Duct Construction Standards—Metal and Flexible) and (SMACNA Fibrous Glass Duct Construction Standards) or (NAIMA Fibrous Glass Duct Construction Standards). All longitudinal and transverse joints, seams and connections shall be sealed in accordance with the Saudi Building Code Energy Conservation Requirements.*	- Check by way of example and document, whether air duct connectors are airtight and comply with the requirements in accordance with SBC 501 4.3.9.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Permanent leaktightness of air ducts and their connections.		
Air ducts Fixings	SBC 1102 Section 1505 Section 1506 Section 1507 Section 1601	***Supports.*** *Ducts shall be supported with approved hangers at intervals not exceeding 3 m or by other approved duct support systems designed in accordance with the Saudi Building Code.*	- Check by way of example and document, whether approved air duct fixings are implemented at spacings of less than 3 metres.	
Air ducts Insulation		***Condensation****. Provisions shall be made to prevent the formation of condensation on the exterior of any duct.* ***Vapor retarders****. Where ducts used for cooling are externally insulated, the insulation shall be covered with a vapor retarder having a maximum permeance of 2.87 ng/(Pa·s·m2) or aluminum foil having a minimum thickness of 0.05 mm. Insulations having a permeance of 2.87 ng/(Pa·s·m2) or less shall not be required to be covered. All joints and seams shall be sealed to maintain the continuity of the vapor retarder.* Protection objective: Prevention of corrosion damage to air ducts for cooling, due to condensation and temperature dropping below the dew point, as a result of non-diffusion resistant insulation.	- Check by way of example and document, whether the air ducts which carry air with a lower temperature than the ambient air have diffusion-resistant insulation on their outside.	
Air ducts Protection in outdoor area		***Weather protection.*** *All ducts including linings, coverings and vibration isolation connectors installed on the exterior of the building shall be adequately protected against the elements.* ***Weatherproof barriers****. Insulated exterior ducts installed outdoors shall be protected*	- Check by way of example and document, whether the air ducts and their accessories, which are laid in the outdoor area, are adequately protected against outdoor effects, such as moisture and sunlight.	

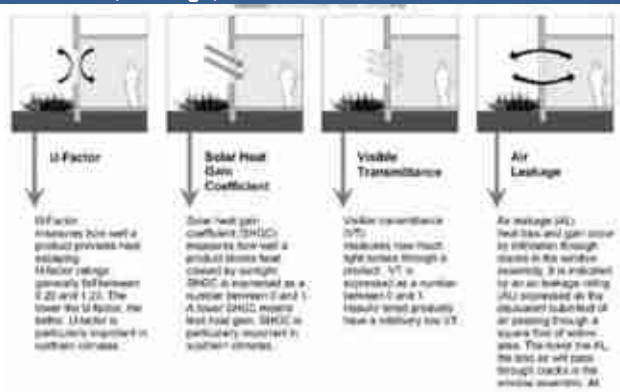
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		from moisture and sunlight degradation via an approved weatherproof barrier. Protection objective: Prevention of damage to the air ducts and their insulation due to external effects.		
Air ducts Insulation	SBC 1102 Section 1505 Section 1506 Section 1507 Section 1601	***Surface temperature.*** *Ducts that operate at temperatures exceeding 49 °C shall have sufficient thermal insulation to limit the exposed surface temperature to 49 °C.*	- Check by way of example and document, whether the insulation of air ducts, which are operated with a temperature above 49 °C, is sufficient to limit the surface temperature of the insulation to 49 °C.	
Ventilation equipment Air filters		***General.*** *Heating and air-conditioning systems of the central type shall be provided with approved air filters. Filters shall be installed in the return air system, upstream from any heat exchanger or coil, in an approved convenient location. Liquid adhesive coatings used on filters shall have a flash point not lower than 163 °C.* Protection objective: Protection from soiling and damage of the components of ventilation equipment in the extract and exhaust air flow.	- Check and document, whether air filters in the extract and exhaust air flow are implemented upstream of each heat exchanger and pipe grid. - Confirmation that the flash point of any adhesive coatings of the air filter is above 163 °C.	
Minimum room temperature in apartments		*Residential occupancies. Dwellings shall be provided with cooling and heating facilities capable of maintaining a room temperature of 20 °C in all habitable rooms, bathrooms and toilet rooms based on the summer/winter outdoor design temperature.* Protection objective: Comfort due to adequate cooling or heating of the dwelling rooms.	- Check by way of example and document, whether the room temperature of 20 °C in residential rooms, bathrooms and toilet rooms is maintained in the summer and winter at the design outdoor temperatures.	

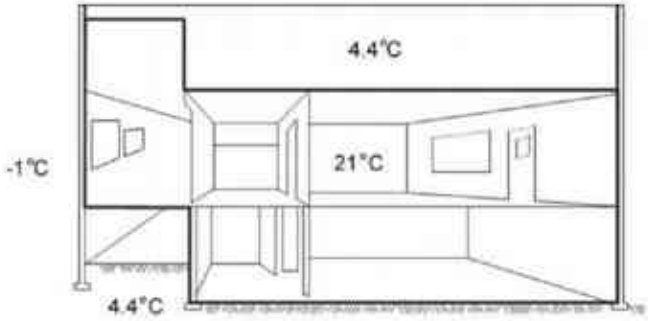
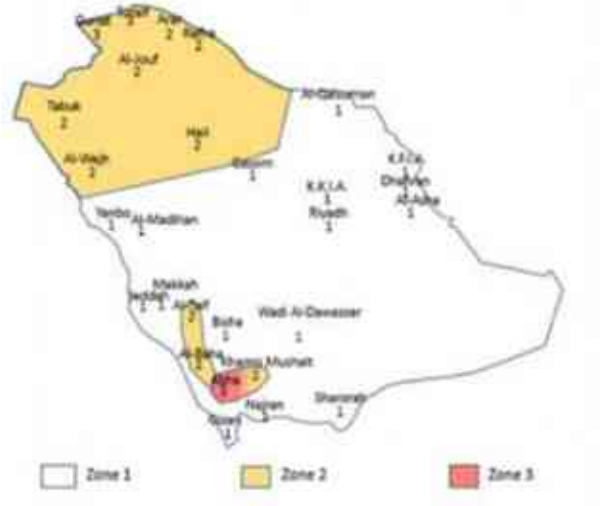
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Air ducts Sealing and fixing	SBC 1102 Section 1505 Section 1506 Section 1507 Section 1601	***Sealing required.*** *All joints, longitudinal and transverse seams, and connections in ductwork, shall be securely fastened and sealed with welds, gaskets, mastics (adhesives), mastic-plus-embedded-fabric systems or tapes. Tapes and mastics used to seal ductwork shall be listed and labeled in accordance with (UL 181A or UL 181B). Duct connections to flanges of air distribution system equipment shall be sealed and mechanically fastened. Unlisted duct tape is not permitted as a sealant on any metal ducts*	- Check and document whether the flange connections of air ducts are sealed and adequately fixed.	 *Sealing and fixing of ducts*
Ventilation systems Shutoff device		***Mechanical ventilation.*** *Each mechanical ventilation system (supply or exhaust, or both) shall be equipped with a readily accessible switch or other means for shutoff, or volume reduction and shutoff, when ventilation is not required. Automatic or gravity dampers that close when the system is not operating shall be provided for outdoor air intakes and exhausts.* Protection objective: Operation of ventilation systems according to requirement.	- Check and document, whether easily accessible switching off devices of ventilation systems and gravity or spring dampers are implemented in outdoor air penetrations.	
Washrooms and toilet rooms		***Light and ventilation.*** *Washrooms and toilet rooms shall be illuminated and ventilated in accordance with the Saudi Building Code* Protection objective: Ventilation of all washrooms and toilet rooms	- Check and document, whether all washrooms and toilet rooms are ventilated naturally or mechanically.	
Heat and cooling load calculations	SBC 1102 Section 1505 Section 1506	***Load calculations.*** *Heating and cooling system design loads for the purpose of sizing*	- Check and document the existences of heat and colling calculations according to ASHRAE.	

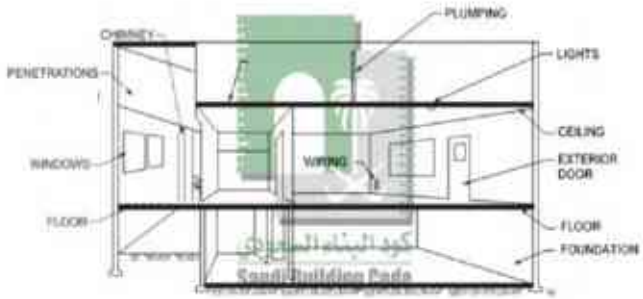
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Section 1507	*systems, appliances and equipment shall be determined in accordance with the* *procedures described in the ASHRAE Handbook of Fundamentals. Heating and cooling loads shall be adjusted to account for load Reductions that are achieved when energy recovery systems are utilized in the HVAC system in accordance with the ASHRAE Handbook – HVAC Systems and Equipment. Alternatively, design loads shall be determined by an approved equivalent computation procedure, using the design parameters specified in the Saudi Energy Conservation Requirements.* Protection goal: - Sufficient power of central components (heat and colling components and of the consumers (heating and airconditioning units).		
Insulation of refrigeration and brine pipes	SBC 1102 Section 1505 Section 1506 Section 1507	***Condensation.*** *All refrigerating piping and fittings, brine piping and fittings that, during normal operation, will reach a surface temperature below the dew point of the surrounding air, and are located in spaces or areas where condensation will cause a safety hazard to the building occupants, structure, electrical equipment or any other equipment or appliances, shall be protected in an approved manner to prevent such damage.* ***Condensation****. Provisions shall be made to prevent the formation of condensation on the exterior of piping.* Protection goal:	- Check and document the temperature of the refrigeration pipes in regard to condensate protection.	 *Condensate protection*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Avoid condensate and thus subsequent damage.		
Refrigeration pipes outside the building		***Insulation installed outdoors**. In addition to the requirements of 9.7.8.1 if insulated refrigerant piping is installed outdoors the piping shall be protected from moisture and sunlight degradation by an approved and acceptable method.*	- Spot check and documentation of appropriate installation outside avoiding damages by external influence such as humidity and UV radiation.	
Leak testing - Refrigeration pipies and systems		***Leak Testing.** All refrigerant field charged equipment and piping shall be leak tested prior to painting, insulation or burial. Leak tests shall be performed in accordance to ASHRAE Refrigeration Handbook.*	- Check the documentation of the leakage test before further steps like insulation installation or painting.	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Building thermal envelope		
SBC 1102 **Section 1101** **Section 1102**	**Interior design conditions** The interior design temperatures used for: 1. **Heating** load: RH 30% and of 21.1°C 2. **Cooling** load: RH 50% and 23.9°C RH = Relative Humidity. **Building thermal envelope insulation:** • The thermal performance of insulation is rated in terms of **R-value**. • An **R-value** identification **mark** shall be applied by the manufacturer to each piece of building thermal envelope insulation. • For products **lacking** an R- value identification, the manufacturer shall provide the **insulation performance data.** • The thermal resistance (R-value) of insulation shall be determined in units of m^2•°C/W. • The R-value of **loose-fill insulation** (blown or sprayed) is dependent on both o the installed thickness and o density (number of bags used). Therefore, loose-fill insulation cannot be directly labeled by the manufacturer. Many blown insulation products carry a manufacturer's R-value guarantee when installed to a designated thickness, "mm = R- value. " **Fenestration product rating:** **U-factors** of fenestration products (windows, doors and skylights) shall be determined in accordance with **NFRC 100** or equivalent.	• Is the U-factors of fenestration products (windows, doors and skylights) determined in accordance with NFRC 100 or equivalent? • Is the building tightness testing performed? • Does the air leakage for fenestration and skylights exceed 1.5 L/s/m^2 when tested at a pressure of 75 Pa? • Is the air leakage test performed in accordance with NFRC 400, or SASO E283?	R-value is the resistance to heat flow which means that the higher the product's R-value, the better it is at insulating the home and improving energy efficiency.  (Copy SBC 1102, page 32) Fenestration refers to the openings and/or entryways found within the facade of a building, including, but not limited to, windows, sliding glass doors, French doors, skylights, curtain walls, dynamic glazing, garden windows and glass block. The U-Factor measures how well the fenestration product insulates heat transfer when the difference between the air temperatures on either side **is one Celsius degree**. The U-factor is the **reciprocal** of the R-value. **Vertical** windows, skylights and doors are rated with U-factors. While the U-Factor can take any value, in general for windows it ranges from 0.20 to 1.20. The lower the U-Factor, the better the window insulates. SHGC measures how much of the sun's heat comes through the window. It can range in value from 0 to 1.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	U-factors shall be **labeled** and certified by the manufacturer and varied by a **3rd party** laboratory accredited by **SAC** (Saudi Accreditation Center) All materials. systems and equipment shall be **installed** in accordance with the **manufacturer's instructions** and SBC 1102 **Glazed fenestration SHGC:** An area- weighted average of fenestration products more than **25-percent glazed** shall be permitted to satisfy the **SHGC** requirements. **Building tightness testing:** • Building tightness testing must be performed on residential dwellings. • Air leakage for **fenestration** and **skylights** shall not exceed **1.5 L/s/m²** when tested at a pressure of **75 Pa** in accordance with NFRC 400, or SASO E283.		 (Copy SBC 1102, page 33)  Max. SHGC and U-factors of fenestration products (windows, doors and skylights) for all climate zones (Copy SBC-602, page 17)

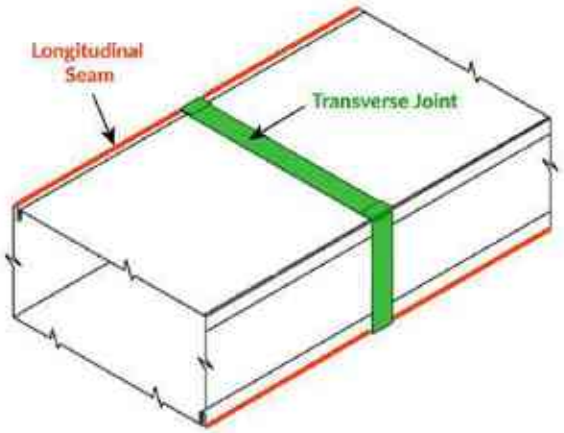
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Conditioned Envelope (Copy SBC 1102, page 32)  Climate Zones (1,2,3) (Copy SBC 1102, page 33)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Typical sources of air leakage (Copy SBC 1102, page 36)  Infrared Surveys for Thermal Envelope
Systems **SBC 1102** **Section 1103** **Section 1413**	**Controls** • At least one thermostat shall be provided for each separate heating and cooling system. • Wall-mounted thermostat shall be mounted on an inside wall.	• Is one thermostat provided for each separate heating and cooling system? • Is the wall-mounted thermostat installed on an inside wall? • Is the thermostat capable of being set from 13°C to 29°C?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

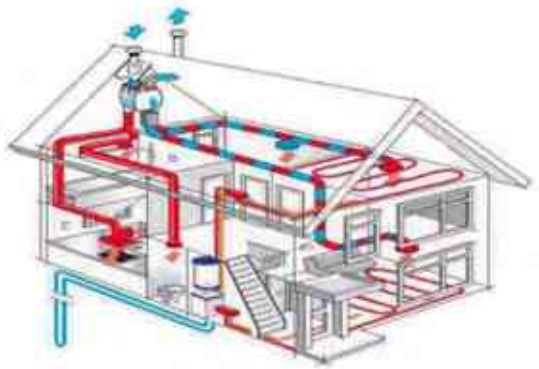
	• Each **thermostat** shall be capable of:
	  ○ being set from **13°C to 29°C** and
	  ○ Operating the system's cooling and/or heating.
	
	• When **automatic changeover** (cooling/heating system) is provided, the thermostat shall have an **adjustable dead band**, the range of which includes a setting of **3°C between heating and cooling**.
		• Is adjustable dead band, provided with automatic changeover system?	
			Is one thermostat provided for each separate heating and cooling system?

	Air distribution system (Air Ducts):		
	Thermal insulation: The **Insulation** of all portions of the air distribution system (**ducts and air handlers**) in or on residential buildings for heating and cooling shall be **R-1.4 m²•°C/W.** **Exception**: Insulation is **not** required when the ducts are within the **conditioned space**. **Sealing of air leakage:** • Ductwork and plenums shall be **sealed** in accordance with **Table 6.2.** (**for** seal levels definitions see **Table 6.3**) • **Outdoor ductwork** shall be sealed before being insulated.	• Is the R-value of Insulation of all portions of the air distribution system R-1.4 m²•°C/W? • Are ductwork and plenums sealed in accordance with Table 6.2?	**TABLE 6.2 Minimum Duct Seal Level[a]** Duct Type Duct Location — Supply — Exhaust — Return Outdoor — A — C — A Unconditioned Space — B — C — B Conditioned Space[b] — C — B — C a See Table 6.3 description of seal level b Includes indirectly conditioned spaces such as return air plenums **TABLE 6.3 Duct Seal Levels** Seal Level — Sealing Requirements[a,c] A — All transverse joints, longitudinal seams, and duct wall penetrations. Pressure-sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A[d] or UL-181B[e], or equivalent, by an independent testing laboratory and the tape is used in accordance with that certification. B — All transverse joints, longitudinal seams. C — Transverse joints only. a — Longitudinal seams are joints oriented in the direction of airflow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod, or wire. Spiral lock seams in a round and flat oval duct need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps, and other branch connections, access door frames and jambs, duct connections to equipment, etc. b — Sealants may be liquid, adhesive, mastic, or tape systems. (Copy SBC-602, page 22)

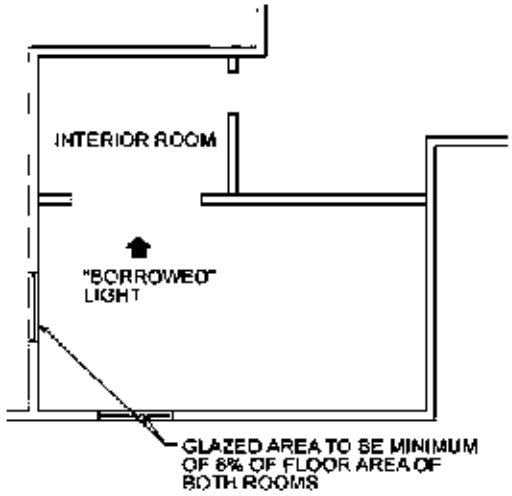
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 *Are ductwork and plenums sealed in accordance with Table 6.2?*
	Mechanical system piping insulation		
	Thermal insulation: Mechanical system piping and service hot water systems shall be insulated to a **minimum** of **R-0.53 m²•°C/W.** **Protection of piping insulation:** Piping insulation exposed to weather shall be protected from damage, including that caused by: • sunlight, • moisture, • equipment maintenance and • wind, and • shall provide shielding from solar radiation that can cause the material. Adhesive tape shall not be permitted.	• Are mechanical system piping and service hot water systems insulated to a minimum of R-0.53 m²•°C/W? • Is piping insulation exposed to weather protected from damages? • Is condensate from cooling coils and evaporators conveyed to an approved place of disposal? • Is condensate piping maintain a minimum horizontal slope in the direction of discharge of not less than one-percent slope?	 Mechanical system piping insulation

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Condensate disposal: • Condensate from cooling coils and evaporators shall be conveyed from the drain pan outlet to an **approved place of disposal.** • Such piping shall maintain a minimum **horizontal slope** in the direction of discharge of not less than one-percent slope. • Condensate **shall not** discharge into a **street,** alley or other areas where it would cause a nuisance.		 Piping insulation exposed to weather
	Evaporative cooling equipment		
	• Evaporative cooling equipment and appliances shall **comply with UL 1995** or UL/CSA/ANCE 60335-2-40. • Exterior equipment shall be installed on a level platform at **least 80 mm** above the surrounding grade to protect the equipment from corrosion. • The evaporative cooling equipment must be installed in accordance with the **manufacturer's instructions**, which are an enforceable extension of the code.	• Do evaporative cooling equipment and appliances comply with UL 1995 or UL/CSA/ANCE 60335-2-40? • Is the exterior equipment installed on a level platform at least 80 mm above the surrounding grade? • Is the evaporative cooling equipment installed in accordance with the manufacturer's instructions?	 Evaporative cooling equipment and appliances

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Natural ventilation and air tightness requirements		
Ventilation **SBC 1101** **Section 303** **SBC 1102** **Section 1501** **Section 1502**	• All habitable rooms are required to be provided with **natural** ventilation through **windows, doors or other approved openings**, with **an option** for **mechanical** ventilation. • For years natural ventilation has been used which relied on the occupants to open windows and doors to provide ventilation to dwellings. While natural ventilation is still allowed, concerns over **indoor air quality** have raised questions over the **effectiveness of naturally ventilating** a dwelling. • There are provisions in the code that allow **mechanical** ventilation to be provided **instead** of **natural** ventilation, and, in some cases, **require mechanical** ventilation to be provided. • When natural ventilation alone is not sufficient for dwellings that are **tightly sealed**, the dwelling is required to be provided with **whole-house mechanical ventilation**. • The **air tightness test** is such that their infiltration rate is 5 or fewer air changes per hour at an indoor/outdoor pressure differential of 50 Pa (ACH50). • In the case where the air infiltration **is 5 ACH or greater**, the code provisions are **not mandatory**, but they can be used by the designer as another tool or option to provide ventilation for a home in lieu of using natural ventilation.	• Is the air tightness test less than ACH50? • Is the dwelling required to be provided with whole-house mechanical ventilation?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Habitable rooms		
	Habitable rooms shall have: • An aggregate glazing area of not less than **8 percent** of the floor area of such rooms for **natural lighting**. • An **openable** area to the outdoors of not less than **4 percent** of the floor area being ventilated for **natural ventilation**. Natural ventilation through openings to the **outdoor air** shall be through: • windows, • skylights, • doors, • louvers or • other approved openings. Such openings shall be provided with: • **ready access** or • **readily controllable** by the building occupants. **Override natural lighting and ventilation requirements for Habitable rooms:** The 8% glazing and the 4% ventilation requirements can be deleted from habitable rooms if **all** the following requirements are met: 1. At least **one operable emergency escape and rescue opening** shall be installed in every **sleeping room** accordance with Section 310 of SBC 1101. (review fire-resistant constructions chapter of inspection handbook). 2. A **whole-house mechanical ventilation system** is installed in accordance with Section 1507 (SBC 1102).	• Do all habitable rooms have an aggregate glazing area of not less than 8 percent of the floor area? • Do all habitable rooms have an openable area to the outdoors of not less than 4 percent of the floor area? • Do all sleeping rooms have at least one operable emergency escape and rescue opening? • Do all emergency escape and rescue opening comply with the code requirements? • In case of overriding the 8% glazing and the 4% ventilation requirements for habitable rooms, are all code requirements met? • For interior rooms, are natural light and ventilation requirements satisfied?	**Habitable rooms** in a dwelling unit are family rooms and bedrooms used for living, sleeping, eating, or cooking. (bedrooms, living rooms, kitchen…) Habitable rooms are typically occupied, and as such they are more highly regulated than **non-Habitable rooms.**  

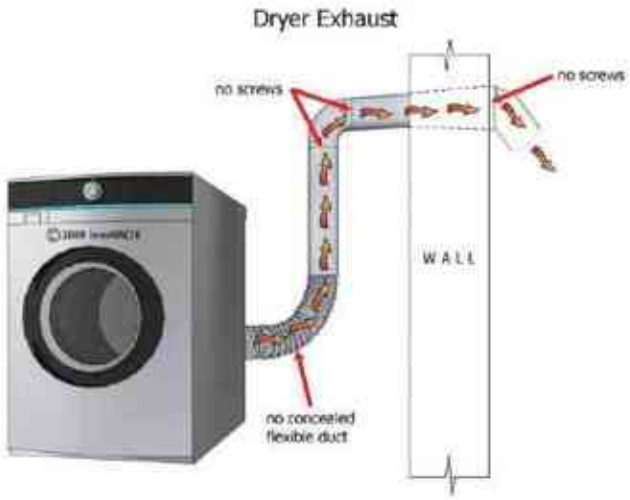
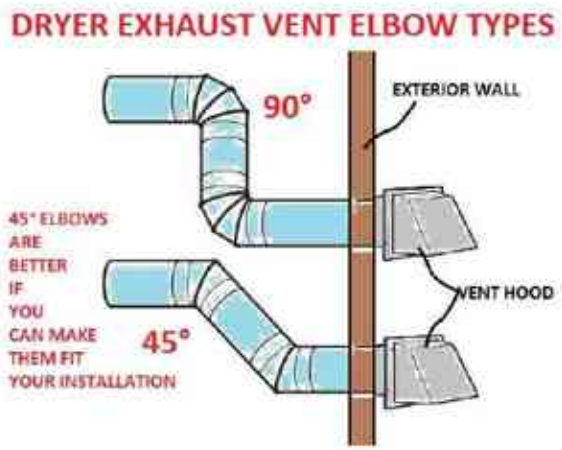
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

	3. **Artificial** light is available that can produce an average illumination of **65 lux** over the room at a **height of 750 mm** above the floor level.
	
	Adjoining rooms:
	Interior rooms are rooms which do not have **access** to an **exterior wall** to satisfy **natural** light and ventilation requirements, they may be considered as part of an adjoining room if:
	• they are open to an adjoining room
	• where not less than one-half of the area of the common wall is:
	  ○ open and
	  ○ unobstructed
	• and provides an opening of not less than one-tenth (**10%**) of the floor area of the interior room and not less than **2.3 m²**.
			
			PLAN VIEW
			(Copy SBC 1101, page 204)

	Bathrooms:		
	Bathrooms, water closet compartments and other similar rooms shall be provided with: • Aggregate glazing area in windows • of not less than **0.3 m²,** • **one- half** of which must be **openable**. **Override glazing requirements of bathrooms:** The glazed areas shall not be required where:	• Are bathrooms, water closet compartments and other similar rooms provided with an aggregate glazing area in windows of not less than 0.3 m², one- half of which must be openable? • In case of overriding the glazing area requirements for bathrooms, are all code requirements met?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	1. artificial light and 2. a local exhaust system are provided. **local exhaust rates:** The **minimum** local exhaust rates shall be determined in accordance with the following: 1. **Kitchens:** 50 l/s intermittent or 10 l/s continuous. 2. **Bathrooms-Toilet Rooms**: Mechanical exhaust capacity of 20 l/s intermittent or 9 l/s continuous. Exhaust air from the space shall be exhausted **directly to the outdoors**	• Are the minimum local exhaust rates for kitchens 50 l/s intermittent or 10 l/s continuous? • Are the minimum local exhaust rates for bathrooms-toilet rooms 20 l/s intermittent or 9 l/s continuous? • Is all local exhaust air exhausted directly to the outdoors?	
	Whole-house mechanical ventilation system		
	Where the **air infiltration** rate of a dwelling unit is **5 air changes per hour (5ACH) or less** were tested with a **blower door** at a pressure of **50 Pa** in accordance with Section 1102.4.1.2 (SBC 1102), the dwelling unit **shall be** provided with **whole-house mechanical ventilation** in accordance with Section 1507.3 (SBC 1102). • The whole-house mechanical ventilation system is designed to mechanically exchange indoor air for outdoor air thus it **must run continuously** or through a programmed intermittent schedule to satisfy the whole-house ventilation rate**.**	• Is whole-house mechanical ventilation mandatory? • Does the whole-house mechanical ventilation run continuously or through a programmed intermittent schedule to satisfy the whole-house ventilation rate? • Is a manual override switch/control provided? • Are mechanical and gravity outdoor air intake openings located not less than 3000 mm from any hazardous or noxious contaminant? • Is exhaust air directed onto walkways? • Are mechanical and gravity outdoor air intake opening 900 mm or greater below the contaminant source?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• A manual override switch/control must be provided to allow the occupants an option to override the system when they will be away. **Air Intake openings**: Mechanical and gravity outdoor air intake openings shall be located not less than **3000 mm** from any **hazardous or noxious** contaminant, such as: • vents, • chimneys, • plumbing vents, • streets, alleys, • parking lots and • loading docks. **Exceptions:** The 3000 mm separation is **not'** required where the intake opening is **900 mm** or greater **below** the contaminant source. **For the purpose of this section**, the exhaust from **dwelling unit**: • toilet rooms, • bathrooms and • kitchen shall **not** be considered as **hazardous or noxious.** **Exhaust openings:** Exhaust air shall **not** be directed onto walkways.		 Gravity air intake (Roof Ventilators)  (Copy SBC 1101, page 204)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Exhaust systems:		
	The **primary intent** of this section is to avoid exhausting contaminants into areas that may be occupied by people or into concealed spaces. **Outdoor discharge:** • The air removed by every **mechanical exhaust system** shall be **discharged to the outdoors.** • Air shall **not be exhausted** into an attic, soffit, ridge vent or crawl space. **Exception**: **Whole-house ventilation-type attic:** Fans that discharge into the attic space of dwelling units having **private attics** shall be permitted. **Clothes dryers exhaust systems:** A clothes dryer will vent about a gallon of water for each load of laundry. If the dryer vent discharges into a crawlspace, attic, or other building cavity, the potential for **moisture-related damage** is significant. Clothes dryers must vent directly to the outside. • Clothes dryers shall be exhausted in accordance with the manufacturer's instructions. • Dryer exhaust systems shall be independent of all other systems and shall convey the **moisture to the outdoors.** **Exception**: **(Ductless) clothes dryers.** This section shall not apply to list and labeled condensing (ductless) clothes dryers.	• Is air removed by every mechanical exhaust system discharged to the outdoors? • Is air removed by every mechanical exhaust system discharged into an attic, soffit, ridge vent or crawl space? • Is the dryer exhaust system independent of all other systems? • Is the dryer exhaust system exhausted in accordance with the manufacturer's instructions and convey the moisture to the outdoors? • Is the dryer a ductless clothes dryer? • Are range hoods discharge to the outdoor through a duct? • Is the duct serving the hood constructed of galvanized steel, stainless steel or copper? • Is the exhaust duct serving the hood independent of all other exhaust systems? • Does the duct serving the hood terminate in an attic or crawl space or areas inside the building? • Are the ductless range hoods installed in accordance with the manufacturer's instructions? • Is mechanical or natural ventilation provided for spaces equipped with ductless range hoods? • Are the minimum domestic kitchen cooking appliances fans rates 50 l/s intermittent or 10 l/s continuous? • Is the Installation of a microwave oven over a cooking appliance comply with the code requirements?	 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Clothes dryers duct termination: • **Exhaust ducts** shall terminate on the **outside** of the building. • Exhaust duct terminations shall be in accordance with the dryer **manufacturer's** installation instructions. • If the manufacturer's instructions do not specify a termination location, the exhaust duct shall terminate **not less than 900 mm** in any direction from openings into buildings. • Exhaust duct terminations shall be equipped with a **backdraft damper**. • Screens shall **not be installed** at the duct termination. **RANGE HOODS:** Range hoods shall discharge to the **outdoor through a duct**. The duct serving the hood shall: • be constructed of galvanized steel, stainless steel or copper. • have a smooth interior surface, • be airtight, • be equipped with a back- draft damper • be independent of all other exhaust systems. • not terminate in an attic or crawl space or areas inside the building **Ductless** range hoods shall not be required to discharge to **the outdoors** where: 1. installed in accordance with the manufacturer's instructions, 2. mechanical or **natural ventilation** is provided.		 Range hoods  Down draft exhaust system

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Kitchen exhaust rates: Where **domestic kitchen cooking** appliances are equipped with: • ducted range hoods or • down- draft exhaust systems, the fans shall be sized in accordance with **Table 15-5.** **Installation of a microwave oven over a cooking appliance:** This section addresses the fire hazard created by having hot surfaces, open flames and, possibly, a cooking fire located under a cooking appliance or microwave oven. The installation shall conform to: 1. The terms of the upper appliance's listing and label. 2. The manufacturer's installation instructions. 3. The microwave oven shall conform to UL 923. 4. The cooking appliance or microwave oven installed above other cooking appliances must be listed for use above the lower appliance.		Table 15-5 MINIMUM REQUIRED LOCAL EXHAUST RATES FOR ONE- AND TWO-FAMILY DWELLINGS AREA TO BE EXHAUSTED | EXHAUST RATES Kitchens | 0.05 m³/s intermittent or 0.01 m³/s continuous Bathrooms-Toilet Rooms | Mechanical exhaust capacity of 0.02 m³/s intermittent or 0.007 m³/s continuous (Copy SBC 1102, page 100)  Installation of a microwave oven over a cooking appliance

8.15 Mechanical / Electrical / Plumbing: Central water heating

Technical Craft

(Central) Water Heating

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
NO Central Heating System ; relevance to local market individual boiler will apply Not used anymore in Germany due to inefficiency and high cost of energy				
Central water heating systems (in the building) Hot water supply systems				
System limits (*Not the subject of this document)*				
Space-heating		Dwelling heating (is regionally hardly ever achieved with hot water in smaller housing)		
Swimming pool heating		Special installations / systems		
Basic principles	SBC 1102 Section 2005 Section 2006		Ability to inspect the central components	
		In particular, water heaters (2.28), Hot water supply system (3.7) Only in relation to the energy efficiency of water heaters (4.4) In particular, solar systems (12) For sound insulation requirements For fire safety requirements		 ***Water heater***
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Leaktightness of the pipe network	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			Electrical equipotential bonding of metal components	 *Equipotential bonding of metal pipes*
			Fire protection equipment for pipes routed between apartments (or general components with fire resistance requirements)	
			Plant operation may not generate any unacceptable noise	
Working basis	Construction documents	Floor plans, sections, schematic diagrams, details, sound insulation requirements, fire protection, waterproofing of structure	Check and document the completeness of the documents	
	Descriptions	System and function descriptions, material definitions, bill of quantities	Check and document the completeness of the documents	
	Calculations	Hot water requirement, simultaneity, pipe dimensioning and design of valves and fittings (e.g. water meters), balancing of a circulation system if necessary (depending on the size of the property), design of drinking water generator and determination of the nominal output of the energy supply	Check and document the completeness of the documents	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Proofs/verifications	Manufacturers' proofs of suitability, leak test records of the hot water pipes, if applicable, commissioning record for a solar system	Check and document the completeness of the documents	
Pipe material, fittings, connections				
Manufacturer's marking	SBC 1102 Section 2005 Section 2006	*Each length of pipe and each pipe fitting, trap, fixture, material and device utilized in a plumbing system shall bear the identification of the manufacturer.* Protection objective: Use of only clearly declared products	Check and document by way of example that only approved materials are used.	
Materials		*All materials used shall be installed in strict accordance with the standards under which the materials are accepted and approved. In the absence of such installation procedures, the manufacturer's installation instructions shall be followed. Where the requirements of referenced standards or manufacturer's installation instructions do not conform to minimum provisions of these requirements SBC 701, the provisions of this code shall apply.* Protection objective: Use of materials tried and tested through continuous long-term use/certified materials only	Check and document by way of example that only approved materials are used, which comply with SBC 701, 1.3.2 to 1.3.4.	
Materials	SBC 1102 Section 2005 Section 2006	*Plastic pipe, fittings and components. All plastic pipe, fittings and components shall be third-party certified as conforming to* ***NSF 14****.* Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only marked materials are used, which comply with NSF 14	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Water heaters				
Dimensioning	SBC 1102 Section 2005 Section 2006	*Sizing. Water heaters utilized for both potable water heating and space-heating applications shall be sized to prevent the space-heating load from diminishing the required potable water-heating capacity.* Protection objective: Establishing of permanent securing of function of an economic system	- Check and document, whether the water heater is designed only for the sanitary installations (hot water) or is also designed for space heating (latter is extremely rare in the region) - Is the storage tank size evidently suitable for the supplied supply outlet points	
Installation/premises		*Water heaters and storage tanks shall be located and connected so as to provide access for observation, maintenance, servicing and replacement.* Protection objective: Establishing permanently suitable space for securing function and operability	- Check and document, whether adequate maintenance is possible and no other impermissible plants are installed in the room. - Check and document, whether adequately dimensioned inlet and outlet openings are present.	
Marking/certification		*Water heater labeling* *Pressure marking of storage tanks* Protection objective: Use of only clearly declared products and documentation of the system parameters (pressure) on site	- Check and document by way of example that only allowable materials are used and the system parameters are present on site	
Temperatures		*Temperature controls* *Water temperature control in piping from tankless heaters* Protection objective: Automatic control and compliance with storage temperatures for securing function	- Check and document, whether appropriate temperature controllers are provided - Check by way of example, whether the SET Values have been set correctly	
Insulation		*Water heaters shall be installed in accordance with the manufacturer's installation instructions. Oil-fired water*	- Check and document, whether adequate insulation is present	

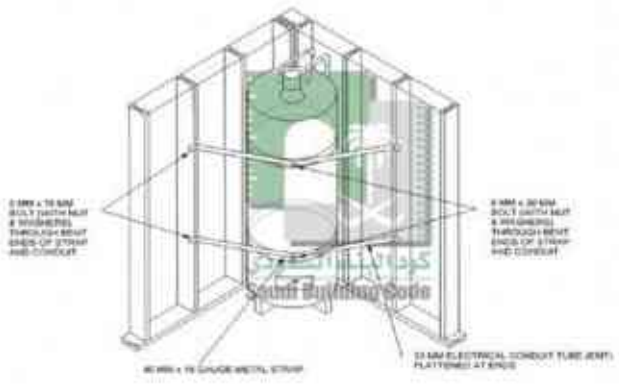
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		heaters shall conform to the requirements of these requirements Protection objective: Protection against water heater heat losses	- Check and document, whether the requirements of the other SBCs ((501/401) are also complied with for oil-fired and electrically operated systems	
Controls	SBC 1102 Section 2005 Section 2006	*Drain valves* *Connections (to cold water)* Protection objective: Establishing permanently suitable operability	- Check and document, whether appropriate drain options are present on the water heater (and in other system components such as the pipe network) and an accessible shutoff valve is present in the water supply pipe.	
Water circulation		*The method of connecting a circulating water heater to the tank shall provide proper circulation of water through the water heater. The pipe or tubes required for the installation of appliances that will draw from the water heater or storage tank shall comply with the provisions of these requirements SBC 701 for material and installation.* *Exception: Water circulation* Protection objective: Maintaining the hot water temperatures	- Check and document, whether circulation is required and if so, is adequately present.	
Safety Devices		*Safety devices* Protection objective: Safeguarding the system, e.g. against overtemperature/overpressure or flooding of the installation room. Water hammers are to be avoided or reduced.	- Check and document, whether the listed safety devices such as pressure relief valve/safety valve or floor drains are present and are evidently adequately dimensioned - Check and document, whether the hot water network is separated from the main water network (protected) - Check and document, whether a pressure reducer is required to protect the hot water system in case of impermissibly high water pressures, and if so that it has been installed and is apparently correct set	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Energy saving	SBC 1102 Section 1103 Section 1104	*Water heaters, storage tanks and boilers shall meet the performance criteria set forth in Sections 4.4.2.1 and 4.4.2.2.* Protection objective: Installation of energy-efficient systems for water heating	- Check and have confirmed that the output efficiency of the water heater conforms with the requirements in Table 4.4.2.1	
Solar system				
General information	SBC 1102 Section 1305 Section 2801 Section 2301	*Potable water supply* *Heat exchangers* *Solar energy equipment and appliances* Protection objective: Establishing permanent securing of function and water hygiene	- Check whether the solar system is part of the non-potable water supply or is separated, e.g. via a heat exchanger. - If separated, protection of the non-potable water supply in accordance with SBC 701	
Installation		*Access shall be provided to solar energy equipment and appliances for maintenance. Solar systems and appurtenances shall not obstruct or interfere with the operation of any doors, windows or other building components requiring operation or access.* Protection objective: Establishing permanently suitable space for securing function and operability	- Check and document, whether adequate accessibility exists for maintenance - If installed outdoors: Is the system protected against damage by vehicles - If installed on the roof: Is the roof structurally designed for the additional loads and are the roof penetrations properly sealed	
Safety Devices		*Equipment* *Pressure and temperature* *Vacuum* *Protection from freezing* *Expansion tanks* *HEAT TRANSFER FLUIDS* Protection objective:	- Check and document, whether temperature and pressure protection devices are installed for the solar circuit - Check whether the system is appropriately protected against freezing (frost protection, e.g. through operation with solar liquid) - Check whether an expansion vessel is installed for closed systems - If solar liquids are used: These may not be flammable	

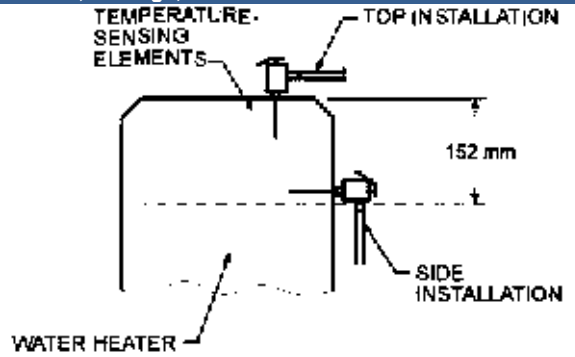
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protecting the system against e.g. overtemperature/overpressure		
Pipe system		Protection objective: Establishing permanently suitable securing of function and durability of the system	- Check whether the pipe system (seals, fixings, etc.) and the pipe fittings and valves, such as shutoff valves, are suitable for the high solar system temperatures or if applicable for contact with solar liquid - Check whether the pipe fixing is adequately dimensioned - Check whether draining and venting devices are installed	
Special installations / systems				
Oil/gas-fired boiler for water heating	SBC 1102 Section 2435	Less important in housing with up to 10 dwelling units		
Swimming pool		Heating of swimming pools with hot water, less important in housing with up to 10 dwelling units		

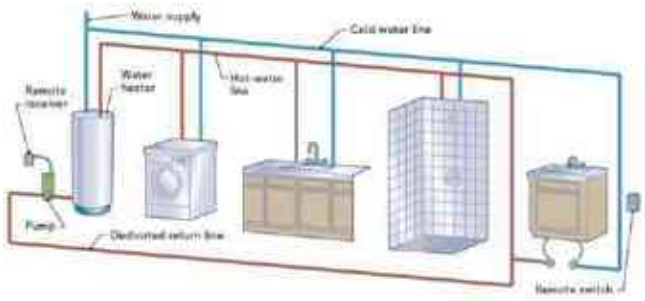
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Inspections, tests				
Leak test	SBC 1102 Section 2417	*Water supply system test. Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping systems other than plastic, by an air test of not less than 350 kPa. The water utilized for tests shall be obtained from a potable source of supply. The required tests shall be performed in accordance with this section and the Saudi Building Code Regulations.* Protection objective: Establishing permanently leaktight execution	- Check and document, whether the required system leaktightness exists	 *Leak test*
System flushing before putting into service		Protection objective: Cleaning of the system and protection of system components, e.g. valves. against damage due to coarse dirt input	- Check and document whether the system and its pipes were sufficiently flushed before putting into service	
Function test		Use of different hot water supply outlet points. Protection objective: Establishing permanently safe to use and reliable function	- Check and document, whether at all supply outlet points in an apartment sufficient (both discharge quantity and temperature) and low-noise hot water is discharged within an acceptable discharge time - Check and document central hot water temperatures	
Visual inspection		Connection to the electrical earthing system/equipotential bonding is present Protection objective: Protection against current/surge damage and electric shock	- Check and document, whether metal system parts are connected to the earthing system - Assessment of the quality should be carried out by the electrical engineering trade	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Water Heaters **SBC 1102** **Section 1305** **Section 2801**	**Central water heater room**		
	Central water heater shall be accessible for: • inspection, • service, • repair and • replacement **without removing** permanent construction, other appliances, or any other piping or ducts not connected to the appliance being inspected, serviced, repaired or replaced. A level working space not less than **750 mm deep and 750 mm wide** shall be provided in front of the control side to service the central water heater	• Is the central water heater accessible? • Is the working space in front of the control side to service the central water heater adequate?	 *Water heater working space*
	Seismic Design		
	Water heater seismic bracing: 1) In Seismic Design Categories D0, D1 and D2 and 2) Townhouses in Seismic Design Category C, water heaters shall be **anchored** or **strapped**: • In the **upper one-third** and • In the **lower one-third**	• Does the Water heater require seismic bracing? • Is the seismic bracing as per the requirements?	

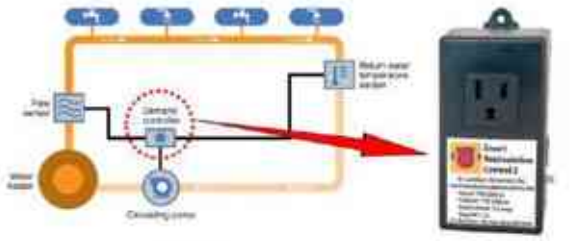
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	of the appliance to **resist a horizontal force** equal to one-third of the operating weight of the water heater, acting in any horizontal direction, or in accordance with the appliance manufacturer's recommendations.		 EXAMPLE OF SEISMIC RESTRAINT FOR SMALL WATER HEATERS (Copy SBC 1102, page 614)
	SOLAR WATER HEATING SYSTEMS		
	• Where heated water is discharged from a **solar thermal system** to a hot water distribution system, a **thermostatic mixing valve** complying with **ASSE 1017** shall be installed to temper the water to a temperature of **not greater than 60°C**. • The thermostatic mixing valve required by this section shall **not** be a **substitute** for **water temperature limiting devices**. • Solar water-heating systems need repair and servicing from time to time, so a **shutoff valve** is required on the **water supply** to the system.	• Is thermostatic mixing valve is installed? • Is thermostatic mixing valve complying with ASSE 1017? • Is the water temperature limiting devices installed? • Is the temperature of heated water discharged from a solar thermal system to a hot water distribution system less than 60°C? • Is the shutoff valve to the water heater supply line installed? • Is bypass piping arrangement to each tank exist?	 Thermostatic mixing valve

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• Where **multiple** storage tanks are installed for a solar water-heating system, **each tank** must have a **bypass piping** arrangement to bypass the tank for **maintenance and replacement.**		
Relief Valves **SBC 1102 Section 2804**	**Pressure- and a temperature-relief valve** **Relief valves** are needed to protect the water heater against **damage and potential violent explosion.** Appliances and equipment used for heating water or storing hot **water shall be protected** by **one** of the following: 1. A **separate** pressure-relief valve and a **separate** temperature-relief valve. 2. A **combination** pressure- and- temperature relief valve. Relief valves shall conform to **ANSI Z21.22.** **Pressure-relief valves** shall be set to open at **not less than 170 kPa** above the system pressure and **not greater than one MPa.** The relief-valve setting **shall not exceed the rated working pressure** of the **tank**. **Temperature-relief valves** shall be installed such that the **temperature**-sensing element: 1. monitors the water within the **top 150 mm** of the tank. **2.** The valve shall be set to open at a temperature of **not** greater than **100°C.**	• Are relief valves to water heaters installed? • Are relief valves conform to **ANSI Z21.22?** • Are relief valves installed in accordance with manufactured instructions?	• **Pressure-relief valves** are designed to relieve **excessive pressures** that can develop in a closed system (the water heater and piping). • **Temperature-relief valves** are designed to open in response to **excessive temperatures** and to discharge heated water, thereby limiting the water temperature in the water heater. • In the event of water heater **control malfunction**, it is possible for the water pressure to exceed the maximum pressure for which the water heater and piping system were designed. Also, water heater control failures could allow excessive temperature rises that could superheat the water (i.e., heated above the temperature at which it would vaporize at atmospheric pressure).  Pressure-relief valve  Temperature and pressure relief valve

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Combination pressure and temperature-relief valves shall comply with the requirements for separate: 1. Pressure -relief valves and 2. Temperature-relief valves.		 (Copy SBC 1102, page 615)
	Vacuum-relief valve:		
	Vacuum-relief valve: **Bottom** fed tank-type water heaters and bottom fed tanks connected to water heaters shall have a **vacuum-relief valve** installed that complies with **ANSI Z21.22.**	• Is the water heater tank is feed from bottom? • Is vacuum-relief valve installed? • Is vacuum-relief valve complying with **ANSI Z21.22**?	 (Copy SBC 1102, page 616)
Water heating systems	**Energy efficiency of central water heater**		
		• Is the demand recirculation system is equipped with automatic time switches or	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
SBC 1102 **Section 1103**	**Demand recirculation** systems are sustainable systems (green building) since they reduce the water and energy consumption. **Demand recirculation** systems are systems designed to maintain usage temperatures in hot-water pipes which will reduce wasting too much potable water waiting for hot water to arrive from the water heater. Thus, **demand recirculation** systems will provide hot water from your taps quickly, without wasting too much water, energy, or money. Examples of **demand recirculation** systems are: **1)** Heated water **circulation** system. **2)** Temperature maintenance system**.** **Demand recirculation** systems **shall be** equipped with **automatic time switches** or other controls that can be set to **switch off** the usage temperature maintenance system during extended periods **when hot water is not required.** **Pumps** of **demand recirculation** systems shall have **controls** that comply with both of the following: 1. **The control** shall start the pump upon receiving a signal from the action of a user or from **automatic time switches** or other controls. 2. **The control** shall limit the temperature of the water entering the cold-water piping to **(40°C).**	other controls that can be set to switch off the system when hot water is not required? • Do the pumps of demand recirculation systems have controls? • Is hot water piping system insulated? • Is the R-value of the hot water pipe insulation being greater than R-0.53 m^2•°C/W? • Is the hot water pipe insulation installed as per the requirements?	 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

	Hot water pipe insulation:
	• **Insulation** for hot water **pipe** with a minimum thermal resistance (R-value) of **R-0.53 m²•°C/W** shall be installed to within **5 cm** of all:
	  • appliances,
	  • fixtures,
	  • structural members, or
	  • a wall where the pipe passes through to connect to a fixture.
	
	• **Insulation** is **not required** where the insulation **interferes** with provisions for mechanical expansion or the mechanical operation of **valves**.
			
			Recirculation Control for the Demand Hot Water system pump
			 
			not required where the insulation interferes with valves
			 
			within 5 cm of appliances

Wiring system **SBC 1102 Section 4105**	**Water heaters electrical circuit**		

	Electric water heaters:
	• Water heaters shall be supplied from a **separate circuit** and through **double pole switch**.
	• Water heaters shall have exposed earthing terminal which all non-current carrying metal parts of water heater are connected to it.
		• Is the water heater supplied from a separate circuit and through double pole switch?
		
		• Is all non-current carrying metal parts of water heater, connected to exposed earthing terminal?
			41-5.1 of SBC 401: Additional protection: Residual current protective devices (RCDs)
			
			• **41-5.1.1:** The use of RCDs with a rated residual operating current **not exceeding 30 mA**, is recognized in AC systems as an **additional protection** in:
			  • the event of failure of the provision for basic protection
			  • and/or the provision for fault protection

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Circuits supplying **instantaneous**-type water heaters (tankless or demand-type water heaters) shall be protected by **RCD** in accordance with 41-5.1. of SBC 401	• Is the circuit supplying instantaneous-type water heater protected by RCD?	• or carelessness by users. **41-5.1.2**: The use of such devices is **not** recognized as a **sole means of protection** and does not obviate the need to apply one of the protective measures specified in 41 -1 to 41-4 of SBC 401. 

8.16 Mechanical / Electrical / Plumbing: Gas installation works

Technical Craft

Gas Installations

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Gas installation systems	Gas installation systems (liquid gas systems in buildings for cooking purposes)			
System limits (*Not the subject of this document)*				
Space-heating / Hot water supply systems	SBC 1102 Section 2447	Residential heating and hot water generation (hardly ever realised in small residential constructions with gas boilers, but rather with electrical systems)		
Gas for technical processes		Special systems		
Basic principles				
Legal foundations				
Technical foundations		In particular, the aeration and ventilation of gas compartments / gas cabinets (3.2)		
		For noise protection requirements		
		For fire protection requirements		
		Property-specific planning foundation		
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Leak-tightness of the pipe network, the pipe fittings and the central components	 ***Leak-tightness of the pipe network***
			Accessibility / ease of replacing or re-filling the central components (e.g. gas bottles)	

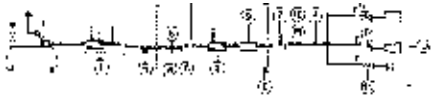
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			System dimensions (liquid gas bottles or tanks) dependent on the number and type of supply points (gas devices)	
			Pipework dimensioning dependent on the number of supply points connected (primarily gas stoves), pressure loss through pipe friction (material, lengths, shaped parts) and pipe fittings	
			Line distances as short as possible and few shaped parts used	
			Corrosion protection / protection from excessive heating of liquid gas tanks and gas lines installed outdoors	
			Electrical bonding of metallic components	
			Fire protection devices for line routing throughout the residence (or general construction components with requirements for fire resistance)	
			System operation shall not create undue noise nuisance	
Working basis	Construction documents	Floor plans, sections, schematics, details, fire protection, structure sealing	Check and document the completeness of the documents	
	Descriptions	System and functional descriptions (type of gas used), material definitions, bills of quantities	Check and document the completeness of the documents	
	Calculations	Pipeline dimensioning and design of installed parts (e.g. gas meters), design of the central components (liquid gas bottles or tanks)	Check and document the completeness of the documents	
	Proofs/verifications	Manufacturer's verification of suitability, leak-tightness checking logs for the gas lines, pos. commissioning logs from manufacturers, verification that the systems comply with the	Check and document the completeness of the documents	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Saudi Building Code Fuel Gas Requirements.		
Raw materials, shaped parts, connections				
Manufacturer's identification		The pipelines used as well as the shaped parts and connection pieces are to be furnished with a manufacturer's identification. Protective goal: Use of explicitly declared products only	Use examples to check and document that only approved materials have been used.	
Airborne noise transfer	SBC 1102 Section 2447	*Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to dwelling unit entrance doors; however, such doors shall be tight fitting to the frame and sill.* Protective goal: Creation of permanent, suitable installation conditions for preventative noise protection Quality level 1: Compliance with SBC 1101	Check and document whether all required noise-related measures for pipework have been seamlessly implemented.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Quality level 2: Seamless, continuous noise protection encasement Quality level 3: Seamless, continuous noise protection encasement and pipe routing outside the wall construction		
Structure-borne noise transfer	SBC 1102 Section 2447	*Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492.* Protective goal: Creation of permanent, suitable installation conditions for preventative noise protection Quality level 1: Compliance with SBC 1101 Quality level 2: Structure-borne noise decoupling layer Quality level 3: Structure-borne noise decoupling layer and installation/routing outside areas subject to noise protection	Check and document whether all required noise-related measures for pipework in the areas of wall/ceiling pass-throughs have been seamlessly implemented.	
Dimensioning, pipe laying, distribution				
Laying of external pipes	Not mentioned in SBC 1102	External pipes for liquid gas systems shall be laid professionally Pipes laid underground shall be protected from mechanical damage and from corrosion. An adequate covering of earth must be assured and any loads present, e.g. due to traffic, shall be taken into account. Adequate protective distances must be maintained between piping laid in parallel to or perpendicular to other pipes. The	- Check whether the exterior pipework has been properly laid in the ground (with protective conduit or with sand layer on all sides). - Check whether there is adequate covering of the piping with earth/sand, pos. in conjunction with mechanical loads (e.g. due to traffic) - Check whether protective distances to other supply lines or waste lines have been complied with	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		introduction into the building (differentiation between underground and exposed introduction) shall be implemented professionally. Protective goal: Creation of permanent, suitable installation conditions for functional assurance, protection of the piping	- Check whether the introduction into the building has been implemented properly (gas-tight and watertight?) - Check whether piping in areas at risk of collisions has been protected (e.g. collision protection)	
Laying of internal pipes	Not mentioned in SBC 1102	Gas lines must be laid without stresses and shall not be fastened to other pipework. The pipelines shall not be exposed to loads in any other manner and shall be protected from the effects of water, e.g. dripping water or condensate from other lines. Gas lines can be laid exposed, under plaster or in shafts/channels. They should be fastened to the structure in accordance with the mechanical strength required by means of pipe brackets (e.g. pipe clamps, screws). In general, non-combustible fastening materials should be used. Gas lines in cavities (e.g. shafts, channels or suspended, closed ceilings) without shape-retaining filling material to be aerated and vented. If the lines are to be laid in the cavities without connections, the aeration and ventilation can be omitted. Protective goal: Creation of permanent, suitable installation conditions for functional assurance, protection of the piping	- Check whether piping has been laid without stresses, separately fastened to the structure (not to other piping or technical installations) and with an appropriate number of fasteners (compliance with max. fastening pitch). - Check whether piping has been laid in cavities and whether there are connections within the cavity. If yes, is the cavity adequately aerated and ventilated in order to prevent increased gas concentration in the event of a leakage. - Check whether fire protection devices are present on piping where it penetrates structural components (walls, ceilings, etc.) with fire protection requirements. - Check whether piping in areas at risk of collisions has been protected	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Dimensioning of piping / pipework fittings	Not mentioned in SBC 1102	Basis of the calculation is the nominal load [kW] of the connected gas devices. In the event of there being multiple gas devices, taking into account the reduction approach for simultaneous use. Pipe diameter, shut-off devices and other components of the gas installation are to be selected such that the pressure loss from the output of the pressure regulator to the output of the device connection fitting does not exceed the usual value [Pa, mbar]. Protective goal: Creation of permanent, suitable installation conditions for functional assurance	- Check and document whether the pipe dimensioning, in particular in the central area such as the main supply line, is ostensibly suitable for the property size and the gas devices supplied. - Check and document whether the dimensioning of pipe fittings, such as gas meters, is ostensibly suitable for the system size (nominal load)	 Pressfitting control my marking position
Installation of gas meters	Not mentioned in SBC 1102	The installation location for any gas meters must be dry, easily accessible and protected from mechanical damage. There shall also be shut-off devices present at the gas meters. Protective goal: Operator-friendly installation of the gas meters and protection from damage and unauthorised access.	- Check and document whether the installation location for the gas meter is easily accessible (e.g. for regular meter readings) - Check and document that there is a shut-off device at the meter	
Shut-off devices and labelling	Not mentioned in SBC 1102	There shall be at least one main shut-off fitting in the gas line network as well as a device shut-off fitting in the immediate vicinity of each device supply point. These shall be unambiguously labelled in accordance with the areas supplied. Protective goal:	- Check whether there is a main shut-off device in the building connection line - Check whether multiple supply points (generally gas stoves) each have a separate device shut-off fitting in the immediate vicinity - Check whether systems with multiple supply points have a logical identification system (labelling) for the shut-off devices	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Creation of an operator-friendly system, shut-offs at the individual supply points for maintenance and servicing work.		
Supply system				
Dimensioning	Not mentioned in SBC 1102	The liquid gas system can be supplied by liquid gas bottles (generally replaced for refilling or refilled elsewhere) or liquid gas tanks (generally refilled in-situ). Protective goal: Creation of permanent functional assurance for an economical system	- Check and document the type of supply points serviced with liquid gas (generally only gas stoves) - Does the liquid gas capacity ostensibly suit the points to be supplied - Is there a reserve bottle provided or present locally if required?	 Liquid gas system with bottles  Liquid gas system with tanks
Installation / set-up	Not mentioned in SBC 1102	Accessibility for maintenance and inspection Protection from mechanical damage Explosion-endangered area Safeguarding of the system from unauthorised access Protective goal: Creation of permanently suitable location and easy implementation of maintenance	- Check and document whether there is adequate accessibility for maintenance, bottle exchange or re-filling - For outdoors installations: Is the system protected from damage by vehicles - Check and document that there are no ignition sources in the potentially explosive area, such as inadequate electrical installations (without EX protection) - Check and document that the system is secured against unauthorised access - If the system has multiple bottles, is there a facility to switch between bottles - Check and document whether the installation area has been identified (e.g. with informative signs)	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Aeration and ventilation	SBC 1102 Section 2447	*Gas rooms, exhausted enclosures and gas cabinets. The ventilation system for gas rooms, exhausted enclosures and gas cabinets for any quantity of hazardous material shall be designed to operate at a negative pressure in relation to the surrounding area.* *Gas rooms. The ventilation system for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding area. The exhaust ventilation from gas rooms shall be directed to an exhaust system.* Protective goal: Creation of permanently suitable location and its aeration and ventilation, if gas bottles are installed in dedicated gas compartments or gas cabinets, for example	- Check and document whether there is adequate aeration and ventilation and that this has been harmlessly vented (e.g. via the roof) - Check and document whether a suitable extraction system is installed in the case of potentially toxic / highly toxic pressurised gases in corresponding gas cabinets - Check and document whether there is slight overpressure relative to the environment, in the gas compartment/cabinet	
Identification/ certification	Not mentioned in SBC 1102	The gas bottles, safety devices, etc. are to be furnished with manufacturer's identification. Protective goal: Use of explicitly declared products only	- Use examples to check and document that only approved or certified materials have been used	
Pressures	Not mentioned in SBC 1102	Corresponding operating pressures must be established for the functionality of the system. Protective goal: Automatic regulation and maintenance of the operating pressures for functional assurance	- Check and document whether corresponding operating pressures have been plausibly established by means of manometers	
Safety devices	Not mentioned in SBC 1102	The supply system, such as gas bottles, shall be protected from damage by means of corresponding safety devices. Protective goal:	- Check and document whether the aforementioned safety devices, such as pressure control valves, gas flow monitors or safety shut-off devices / safety relief valves, are present and ostensibly adequately dimensioned	

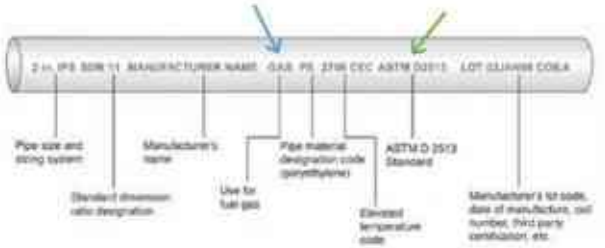
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Safeguarding the system, from overpressure for example		
Equipotential bonding	Not mentioned in SBC 1102	Metallic components such as pipework systems are to be incorporated into the equipotential bonding (earthing system) system of the building. Protective goal: Protection from current/overvoltage damage and electric shock	- Check and document that the system has been connected to the earthing system with approved earthing clamps	
Liquid gas tanks	Not mentioned in SBC 1102	Liquid gas tanks are to be equipped with corresponding material protecting measures depending on the installation in the building or outdoors (underground or above-ground). Protective goal: Creation of permanent, suitable installation/set-up conditions for functional assurance	- Check and document that the exterior and above-ground tank systems are protected from direct solar radiation (e.g. reflective coating) - Check and document that the exterior and underground tank systems are protected against corrosion - Check and document that the construction unit (comprising pressure measurement device, over-filling safeguard, etc.) has been professionally installed	
Liquid gas bottles	Not mentioned in SBC 1102	Liquid gas bottles are to be equipped with corresponding protective measures for the bottles themselves (e.g. in the gas cabinets), depending on the installation in the building or outdoors. Protective goal: Creation of permanent, suitable installation/set-up conditions for functional assurance	- Check and document that the with the erection of special bottle cabinets these are suitable/approved accordingly and that the installation has been properly implemented, for example compliance with potentially explosive areas or prevention of unauthorised access.	
Tests				
Leak-tightness testing	Not mentioned in SBC 1102	The liquid gas tanks or bottles as well as the piping network and the fittings contained within it, such as shut-off valves, must be constructed as a gas-tight unit.	- Check and document whether the system meets the required leak-tightness, by means of documentation/logs	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Corresponding leak-tightness testing must therefore be carried out before initial commissioning. Protective goal: Creation of permanently leak-tight system		
Strength testing	Not mentioned in SBC 1102	The strength must also be checked within the course of the leak-testing. Protective goal: Determination that the pressure-retaining walls are leak-tight when operating pressure is applied and that no safety-relevant deformations occur.	- Check and document whether the system exhibits the required strengths, by means of documentation/logs	
Functional test	Not mentioned in SBC 1102	Functional test at various supply points (generally gas stoves). Protective goal: Creation of permanently safe functionality	- Check and document by means of example, whether the supply points of an apartment are adequately supplied with gas and that they function accordingly - Check and document central operating pressures	
Visual check	Not mentioned in SBC 1102	Connection to the electrical earthing system / equipotential bonding system present Protective goal: Protection from current/overvoltage damage and electric shock	- Check and document whether the metallic parts of the system have been connected to the earthing system - Quality assessment to be carried out by an electrician	 *Earthing of metallic parts*
Documentation				
Operating instructions Maintenance, care and servicing instructions		For the central liquid gas tanks or bottles, pos. other fittings (e.g. gas flow monitors) Protective goal: Creation of permanently safe functionality	- Check and document whether corresponding, operating instructions formulated for a layman are available	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
As-built drawing		As-built drawing with dimensions and information on the mass flows Protective goal: Creation of permanently safe functionality	- Check and document whether there is complete documentation existing that properly represents the as-built status	
Test logs, expert assessments/ verifications		Test logs for leak-tightness and strength testing for the gas system Expert assessments/verifications for all parts of the system that are exposed to pressure, in particular the liquid gas bottles or tanks and their connection fittings	- Check and document whether test logs and expert assessments/verifications are available	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Inspection and testing **SBC 1102 Section 2417**	**General Requirements**		
	Prior to acceptance **and** initial operation of the gas system, all piping installations shall be: **1.** **visually** inspected, and **2.** pressure tested**.** **Test medium:** The test medium shall be: a) Air, b) Nitrogen, c) Carbon dioxide or d) An inert gas. Oxygen shall **not** be used. Oxygen is not inert, and any residual amount could form an explosive mixture with the fuel gas. The gas that is forced into the piping system for pressure testing must be **chemically unreactive** to prevent: • undesirable reactions with the piping system components and • the fuel to be conveyed in the piping. Nitrogen and carbon dioxide are considered to be **inert** for the purpose of testing piping systems and are **inexpensive** compared to most truly inert gases. **The typical** test gas is **air**, which is also **not inert** but is **readily available and free.** **Testing precautions.** Testing of piping systems shall be performed in a manner that protects the **safety of employees and the public** during the test.	• Are all gas piping installations visually inspected, and pressure tested? • Is the test pressure used less than 1.5 times the proposed maximum working pressure? • Is the pressure test duration less than 10 minutes? • Does the piping system withstand the test pressure without showing any evidence of leakage or other defects?	**An *inert gas*** is a *gas* that does not undergo chemical reactions under a set of given conditions

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Why? Compressed gases **store energy** in direct proportion to the **pressure**. This stored energy can be **destructive and dangerous** to personnel if released quickly because of joint, component or **pipe failure** or an intentional action. **Test pressure:** The test pressure to be used shall be **not less than 1.5** times the proposed **maximum working pressure**, but the test pressure shall not exceed a value that produces a hoop stress in the piping greater than **50 percent** of the specified **minimum yield strength of the pipe.** **Test duration**: The test duration shall be **not less than 10 minutes.** **Detection of leaks and defects:** The piping system shall withstand the test pressure specified without showing any evidence of: • leakage or • other defects. Any **reduction of test pressures** as indicated by pressure gauges shall be deemed to indicate the **presence of a leak** unless such reduction can be **readily attributed to some other cause.** **Detection methods:** Once the pressure measuring instrument **indicates leakage**, the leak or leaks must be **located** for repair or replacement. Electronic sensors and bubble fluids		

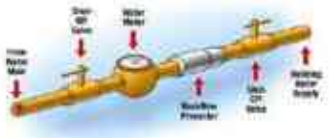
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	are used to find leaks that are not readily found by human senses.		 **Bubble fluids**
Piping Materials **SBC 1102** **Section 2414**	**Plastic pipe, tubing, and fittings.** Polyvinyl chloride **(PVC)** and chlorinated polyvinyl chloride **(CPVC)** plastic pipe, tubing and fittings **shall not** be used to supply **fuel gas**. **Why?** Because of the **brittle nature** of PVC and CPVC, especially at low temperatures, these materials are not suitable for conveying fuel gas. **Allowed plastic pipe, tubing, and fittings:** **1)** Polyethylene plastic pipe, tubing and fittings used to supply **fuel gas** shall conform to **ASTM D2513**. Such pipe shall be **marked "Gas" and "ASTMD2513."** **2)** Plastic pipe, tubing and fittings, **other than polyethylene**, shall be identified and conform to the **2008 edition of ASTM D2513.** Such pipe shall be **marked "Gas" and "ASTM D2513."**	• Are PVC/CPVC plastic pipes used in the gas system? • Are plastic pipe, tubing, and fittings used in the gas system conform to ASTM D2513 and marked "Gas" and "ASTMD2513."	 ***Conformtion to ASTM D2513***

8.17 Mechanical / Electrical / Plumbing: Water and wastewater installation work

Technical Craft

Water and Wastewater Installations

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Water installations in new residential buildings to be built				
Basic principles				
Legal foundations	SBC 1102 Section 2602 Section 2603 Section 2902			
Technical foundations		For drinking water protection requirements		
		Property-specific planning foundation		
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Ability to inspect and unobstructed access to the central components	
			No unreasonable noise impact due to operation of the plant, inside and outside of the building	
			Electrical equipotential bonding of metal pipes of the public supply, which are routed from the outside into the building	 ***Electrical equipotential bonding of metal pipes***
			Adequate structural design and load-bearing capacity of the installation areas of non-potable water tanks when completely filled	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			Insulation of the non-potable and drinking water pipes to prevent condensation from forming on the pipes and subsequent damage	 *Insulation of water pipes*
			Execution of inherently safe supply discharge fittings (faucets), to prevent backflow into the non-potable or drinking water system	 *Prevention of backflow*
			Safe disconnection of the power supply of the electrically operated central components (booster systems, etc.), for example, by means of repair switch	
Working basis	Construction documents	Floor plans, sections, schematic diagrams, details, sound insulation requirements, fire protection	Check and document the completeness of the documents	
	Descriptions	System and function descriptions, material definitions, bill of quantities	Check and document the completeness of the documents	
	Calculations	Non-potable and drinking water consumption, simultaneities, pipe dimensioning, design of non-potable water tanks	Check and document the completeness of the documents	
	Proofs/verifications	Pipe pressure of the public supply pipes (non-potable and drinking water pipes), operating, servicing and maintenance instructions of the manufacturers	Check and document the completeness of the documents	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Wall and ceiling penetrations Utility pipes and cables	SBC 1102 Section 2602 Section 2603 Section 2902	***Corrosion.*** *Pipes passing through concrete or cinder walls and floors or other corrosive material shall be protected against external corrosion by a protective sheathing or wrapping or other means that will withstand any reaction from the lime and acid of concrete, cinder or other corrosive material. Sheathing or wrapping shall allow for expansion and contraction of piping to prevent any rubbing action. Minimum wall thickness of material shall be 0.65 mm.* Protection objective: - Protection of metal pipes from corrosion in the area of ceiling and wall penetrations. Insulation of pipes (from structure) in the area of ceiling and wall penetrations, to prevent the transfer of operating noises as well as noises or damage caused by elongation of the pipe.	Check and document that pipe protection devices are present in the area of ceiling and wall penetrations.	 *Protection against external corrosion by a protective sheathing or wrapping*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Outdoor area Utility pipes and cables	SBC 1102 Section 2602 Section 2603 Section 2902	*Water, soil and waste pipes shall not be installed outside of a building, in attics or crawl spaces, concealed in outside walls, or in any other unless adequate provision is made to protect such pipes . Exterior water supply system piping shall be installed not less than 150 mm below the frost line and not less than 300 mm below grade.* ***FOR CERTAIN AREAS OF KSA** :* Protection objective: Protection of the pipes against freezing in the outdoor area.	Check and document that equipment for protection against freezing of the water pipes is present or that the pipes are laid at least 150 mm deep in the ground.	 *Protection against freezing*
Cold and hot water pipes Separate laying	SBC 1102 Section 2602 Section 2603 Section 2902	***Parallel water distribution systems.** Piping bundles for manifold systems shall be supported in accordance with Table 1.8.5. Support at changes in direction shall be in accordance with the manufacturer's install-lation instructions. Hot and cold-water piping shall not be grouped in the same bundle.* Protection objective: Preventing the heating of cold-water pipes.	Check and document that the cold-water pipes have not been laid next to hot water pipes.	 *Cold-water pipes have not been laid next to hot water pipes*
Water pipes Minimum diameter	SBC 1102 Section 2602 Section 2603 Section 2902	***Size of water service pipe.** The water service pipe shall be sized to supply water to the structure in the quantities and at the pressures required in these code requirements SBC 701. The minimum diameter of water service pipe shall be 20 mm.*	Check and document whether the water supply pipes have a minimum diameter of 20 mm.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Adequate supply to the water outlet points.		
Water pipes Dimensioning	SBC 1102 Section 2602 Section 2603 Section 2902	***Water distribution system design criteria.*** *The water distribution system shall be designed, and pipe sizes shall be selected such that under conditions of peak demand, the capacities at the fixture supply pipe outlets shall not be less than shown in Table 3.4.3. The minimum flow rate and flow pressure provided to fixtures and appliances not listed in Table 3.4.3 shall be in accordance with the manufacturer's installation instructions.* Protection objective: Adequate supply to the water outlet points.	Check and document by way of example whether the water flow and the flow pressure at the water outlet points as specified in SBC 701 Table 3.4.3 are achieved.	
Water pipes Hydraulic shocks		***Water hammer.*** *The flow velocity of the water distribution system shall be controlled to reduce the possibility of water hammer. A water-hammer arrestor shall be installed where quick-closing valves are utilized. Water-hammer arrestors shall be installed in accordance with the manufacturer's specifications. Waterhammer arrestors shall conform to ASSE 1010.* Protection objective: - Leaktightness of the water pipes due to compensation of hydraulic shocks by means of water hammer arrestors. Prevention of operating noises in water pipes by compensating for hydraulic shocks by means of water hammer arrestors.	Check and document by way of example whether hydraulic shocks in water pipes with and caused by, e.g. single-lever faucet fittings, are reduced to an allowable level by means of water hammer arrestors.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Water distribution valves Labelling	SBC 1102 Section 2602 Section 2603 Section 2902	***Valves.*** *Individual fixture shutoff valves installed at the manifold shall be identified as to the fixture being supplied.* Protection objective: Targeted shutting off of a valve at the water manifold by labelling with clear assignment of the supplied apartments or areas.	Check and document by way of example whether all shutoff valves in the water distributor (manifold) are clearly labelled with details of the supplied apartments or areas.	
Materials Utility pipes and cables		***Water service pipe****. Water service pipe shall conform to NSF 61 and shall conform to one of the standards listed in Table 3.5.3. All water service pipes or tubing, installed underground and outside of the structure, shall have a minimum working pressure rating of 1100 kPa at 25oC. Where the water pressure exceeds 1100 kPa, piping material shall have a minimum rated working pressure equal to the highest available pressure. Plastic water service piping shall terminate within 1.5 m inside of the point where the pipe penetrates an exterior wall or slab on grade. All ductile iron water pipe shall be cement mortar lined in accordance with AWWA C104.* ***Water distribution pipe****. Water distribution pipe shall conform to SASO to NSF 61 and shall conform to one of the standards listed in Table 3.5.4. All hot water distribution pipe and tubing shall have a minimum pressure rating of 700 kPa at 80 °C.* Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only approved materials are used, which comply with SBC 701 Tables 3.5.3 and 3.5.4.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Shutoff valves in water pipes Requirement	SBC 1102 Section 2602 Section 2603 Section 2902	***Location of full-open valves.*** *Full-open valves shall be installed in the following locations:* *1. On the building water service pipe from the public water supply near the curb.* *2. On the water distribution supply pipe at the entrance into the structure.* *3. On the discharge side of every water meter.* *4. On the base of every water riser pipe in occupancies other than multiple-family residential occupancies that are two stories or less in height and in one- and two-family residential occupancies.* *5. On the top of every water down-feed pipe in occupancies other than one- and two-family residential occupancies.* *6. On the entrance to every water supply pipe to a dwelling unit, except where supplying a single fixture equipped with individual stops.* *7. On the water supply pipe to a gravity or pressurized water tank.* *8. On the water supply pipe to every water heater.* Protection objective: Shutting off of parts of the water supply system of a building without impairing the supply to the remaining parts.	Check and document by way of example whether shutoff valves are present in accordance with the requirements of SBC 701 3.6.1.	 Shutoff valves sanded during floor installation – Functions to be checked after cleaning.
Shutoff valves in water connection pipes Requirement	SBC 1102 Section 2602 Section 2603 Section 2902	***Location of shutoff valves.*** *Shutoff valves shall be installed in the following locations:* *1. On the fixture supply to each plumbing fixture other than bathtubs and showers in one- and two-family residential occupancies, and other than in individual guestrooms that are provided with unit shutoff valves in hotels, motels, boarding houses and similar occupancies.* *2. On the water supply pipe to each sillcock.*	Check and document by way of example, whether shutoff valves and angle pattern valves are present in accordance with the requirements to SBC 701 3.6.2.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		3. On the water supply pipe to each appliance or mechanical equipment. Protection objective: Shutting off of parts of the water supply system of an apartment without impairing the supply to the remaining parts.		
Shutoff valves in water pipes Accessibility	SBC 1102 Section 2602 Section 2603 Section 2902	***Access to valves.*** *Access shall be provided to all required full-open valves and shutoff valves.* Protection objective: Unobstructed operation of the shutoff valves at any time.	Check and document by way of example whether the shutoff valves are accessible.	
Water connection valves Labelling		***Valve identification.*** *Service and hose bibb valves shall be identified. All other valves installed in locations that are not adjacent to the fixture or appliance shall be identified, indicating the fixture or appliance served.* Protection objective: Targeted shutoff of a water connection pipe due to labelling with clear assignment to the respective water supply outlet point.	Check and document by way of example whether the shutoff valves of water connection pipes are clearly labelled with details of the supplied apartments or areas.	
Water pipes Labelling		***Identification of potable and nonpotable water.*** *In all buildings where two or more water distribution systems, one potable water and the other nonpotable water, are installed, each system shall be identified either by color marking or metal tags in accordance with Sections 3.8.8.1 through 3.8.8.3.* ***Information.*** *Pipe identification shall include the contents of the piping system and an arrow indicating the direction of flow. Hazardous piping*	Check and document by way of example whether in buildings with drinking water pipes, all water pipes are clearly visible and are labelled with flow direction arrows. The respective medium must be apparent from the labelling by way of the medium colour.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		systems shall also contain information addressing the nature of the hazard. Pipe identification shall be repeated at maximum intervals of 7 m and at each point where the piping passes through a wall, floor or roof. Lettering shall be readily observable within the room or space the piping is located. ***Color.*** *The colour of the pipe identification shall be discernable and consistent throughout the building.* Protection objective: Clear identification of drinking water and non-drinking water pipes.		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Water supply lateral pipe (service connection)	SBC 1102 Section 2602 Section 2603 Section 2902	***Inadequate water pressure.*** *Wherever water pressure from the street main or other source of supply is insufficient to provide flow pressures at fixture outlets as required under Table 3.4.3, a water pressure booster system conforming to Section 3.6.5 shall be installed on the building water supply system.* ***Water pressure booster systems required.*** *Where the water pressure in the public water main or individual water supply system is insufficient to supply the minimum pressures and quantities specified in these requirements SBC 701, the supply shall be supplemented by an elevated water tank, a hydropneumatic pressure booster system or a water pressure booster pump installed in accordance with Section 3.6.5.5.* Protection objective: Adequate supply of the water outlet points by means of a water pressure boosting system.	Check and document by way of example whether the water flow and the flow pressure at the water outlet points as specified in SBC 701 Table 3.4.3 are achieved.	
Water supply lateral pipe (service connection)		***Water-pressure reducing valve or regulator.*** *Where water pressure within a building exceeds 550 kPa static, an approved water-pressure reducing valve conforming to ASSE 1003 with strainer shall be installed to reduce the pressure in the building water distribution piping to 550 kPa static or less. Exception: Service lines to sill cocks and outside hydrants, and main supply risers where pressure from the mains is reduced to 550 kPa or less at individual fixtures* Protection objective: - Avoiding the spread of flow noises to the water supply system due to a central pressure reduced.	Check and document whether the static water pipe pressure downstream of a pressure reducer in the flow direction is less than 550 kPa.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		- Discharge volumes at the water supply outlet points are as intended due to a central pressure reducer.		
Leak test Water supply system	SBC 1102 Section 2602 Section 2603 Section 2902	***Water supply system test.*** *Upon completion of a section of or the entire water supply system, the system, or portion completed, shall be tested and proved tight under a water pressure not less than the working pressure of the system; or, for piping systems other than plastic, by an air test of not less than 350 kPa. The water utilized for tests shall be obtained from a potable source of supply. The required tests shall be performed in accordance with this section and the Saudi Building Code Regulations.* Protection objective: Leaktightness of the water supply system	Check the documentation of the leaktight tests in accordance with the implementation requirements to SBC 701, 1.12.5	
Dishwasher water connection		***Water connection.*** *The water supply to a dishwashing machine shall be protected against backflow by an air gap or backflow preventer in accordance with Section 3.8.* Protection objective: Protects the water supply system from backflow from a dishwasher	Check and document, whether the non-potable water is fed to a dishwasher via a backflow preventer or a free outlet.	
Bath and shower fittings Maximal discharge temperature		***Shower valves.*** *Shower and tub-shower combination valves shall be balanced pressure, thermostatic or combination balanced-pressure/thermostatic valves that conform to the requirements of ASME 1016, CSA B125.*	Check and document, whether the hot water discharge temperature at bath and shower fittings is limited to 50 °C maximum.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Disinfection of drinking water pipes	SBC 1102 Section 2602 Section 2603 Section 2902	***General.*** *New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be as described in this section. This requirement shall apply to "on-site" or "in-plant" fabrication of a system or to a modular portion of a system.* *1. The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.* *2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200 mg/L) of chlorine and allowed to stand for 3 hours.* *3. Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.* *4. The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.* Protection objective: Prevention of disadvantageous impairment of drinking water hygiene of new installed drinking water systems or after repairs.	Check the documentation of any disinfection measures in accordance with the implementation requirements to SBC 701, 3.10.1.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Wastewater (in the building)	- Sanitary drainage systems - Sanitary venting systems			
System limits (*Not the subject of this document)*				
Sanitary Sewer systems	SBC 1102 Section 2602 Section 2603 Section 2902	Buried drainage systems on the lot		
Storm drainage systems		Buried rainwater drainage on the lot		
Structural drainage		Only for keeping the excavations dry, not permanent soil drainage, e.g. for keeping the structure dry		
Municipal drainage		Wastewater, combined or stormwater drainage outside of lots in the public area		
Special installations / systems		Vacuum drainage		
Basic principles				
Legal foundations	SBC 1102 Section 2602 Section 2603 Section 2902			
Technical foundations		Sanitary drainage and vent systems		
		For sound insulation requirements		
		For fire protection requirements		
		Property-specific planning foundation		
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Gravity drainage	
			All pipes must be continuously free running (flowing)	
			Maximum pipe fill 50%	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			30 l/s air must be moved in the counterflow for 1 l/s wastewater discharge	
			The pipe fill level (degree of fill) and gradient must correspond, over-large dimensions or excessive gradients tend to cause blockages	
			Lateral inlets into collecting pipes must be connected with 15° angle from above to protect against backflows and the formation of deposits	
			Dimension changes in horizontal pipes may only be made with level crowns (tops) of pipe, so that air can flow out without obstruction	
			Cross-section reductions in flow direction are not allowed	
			Odour traps may not be drawn empty during discharge, sewer gases must never escape into enclosed rooms	
			Plant operation may not generate any unacceptable noise	
Working basis	Construction documents	Floor plans, sections, schematic diagrams, details, sound insulation requirements, fire protection, waterproofing of structure	Check and document the completeness of the documents	
	Descriptions	System and function descriptions, material definitions, bill of quantities	Check and document the completeness of the documents	
	Calculations	Wastewater quantity/flow, simultaneities, pipe dimensioning	Check and document the completeness of the documents	
	Proofs/verifications	Manufacturers' proofs of suitability, performance of the connection point to the higher-level (main) drainage	Check and document the completeness of the documents	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Pipe material, fittings, connections				
Materials	SBC 1102 Section 2602 Section 2603 Section 2902	*Above-ground sanitary drainage and vent pipe. Above-ground soil, waste and vent pipe shall conform to one of the standards listed in* ***Table 4.2.1****.* Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only allowable materials are used, which comply with SBC 701 Table 4.2.1	
		Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 4.2.2. Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only allowable materials are used, which comply with SBC 701 Table 4.2.2	
		Plastic pipe, fittings and components. All plastic pipe, fittings and components shall be third-party certified as conforming to ***NSF 14****.* Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only marked materials are used, which comply with NSF 14	
		Components of the condensate disposal system shall be cast iron, galvanized steel, copper, cross-linked polyethylene, polybutylene, polyethylene, ABS, CPVC, or PVC pipe or tubing. All components shall be selected for the pressure and temperature rating of the installation. *Condensate waste and drain line size shall not be less than 20 mm internal diameter and shall not decrease in size from the drain pan*	Check and document by way of example that only approved materials are used	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		connection to the place of condensate disposal. Where the drain pipes from more than one unit are manifolded together for condensate drainage, the pipe or tubing shall be sized in accordance with an approved method. All horizontal sections of drain piping shall be installed in uniform alignment at a uniform slope. Protection objective: Use of materials tried and tested through continuous, long-term use only		
Manufacturer's marking		*Each length of pipe and each pipe fitting, trap, fixture, material and device utilised in a plumbing system shall bear the identification of the manufacturer.* Protection objective: Use of only clearly declared products	Check and document by way of example that only marked materials are used	
Pipe laying, connections				
Underground (buried) pipes	SBC 1102 Section 2602 Section 2603 Section 2902	*Where rock is encountered in trenching, the rock shall be removed to a minimum of 75 mm below the installation level of the bottom of the pipe, and the trench shall be backfilled to the installation level of the bottom of the pipe with sand tamped in place so as to provide uniform load-bearing support for the pipe between joints. The pipe, including the joints, shall not rest on rock at any point.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether a correct pipe trench has been made - Check randomly whether correct pipe cover has been laid	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Backfill shall be free from discarded construction material and debris. Loose earth free from rocks, broken concrete and frozen chunks shall be placed in the trench in 150 mm layers and tamped in place until the crown of the pipe is covered by 300 mm of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by these requirements SBC 701, the material shall be installed in accordance with the more restrictive requirements. Protection objective: Establishing permanently suitable laying conditions for securing function	Check randomly and document whether correct pipe bedding/embedment was made in the ground	
Flood protection		*For structures located in flood hazard areas, the following systems and equipment shall be located at or above the design flood elevation: all sanitary drainage piping. Manhole covers shall be sealed, except where elevated to or above the design flood elevation.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check by way of example and document whether there is a risk of flooding in the building/project - If yes, have adequate safeguards been provided?	
Slope		*Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The minimum slope of a horizontal drainage pipe shall be in accordance with* ***Table 4.4.1.***	- Check randomly and document whether a continuous gradient exists according to the design	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether the minimum gradient in accordance with Table 4.4.1 has been complied with?	
Cleaning equipment		*Cleanouts or inspection chambers shall be installed at each change of direction of the building drain or horizontal waste or soil lines greater than 45 degrees. Where more than one change of direction occurs in a run of piping, only one cleanout or inspection chambers shall be required for each 12 m of developed length of the drainage piping.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether a sufficient number of cleaning options have been installed - Check randomly and document whether the cleaning options have been provided in the correct places	
Ventilation above roof		*All open vent pipes that extend through a roof shall be terminated at least 0.3 m above the roof, except that where a roof is to be used for any purpose other than weather protection, the vent extensions shall be run at least 2 m above the roof.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether all required ventilation ducts are also adequately routed above the roof.	
			- Check and document whether all the required wall and/or ceiling penetrations of pipes have been closed off to the necessary fire-protection rating.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Sound insulation	SBC 1102 Section 2602 Section 2603 Section 2902			Bad practice:  No structure-borne sound insulation between pipe and structure and sufficient space for such installation also not allowed for in the design, in the further fitout a structure-borne sound bridge results unavoidably and can no longer be compensated for Best practice: Whole length of the pipe with structure-borne sound insulation covering and fixed using structure-borne sound insulated fixing elements Pipe lies in a separate casing in front of the wall

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1102 Section 2602 Section 2603 Section 2902	*Walls, partitions and floor/ceiling assemblies separating dwelling units from each other or from public or service areas shall have a sound transmission class (STC) of not less than 50 (45 if field tested) for air-borne noise when tested in accordance with ASTM E 90. Penetrations or openings in construction assemblies for piping; electrical devices; recessed cabinets; bathtubs; soffits; or heating, ventilating or exhaust ducts shall be sealed, lined, insulated or otherwise treated to maintain the required ratings. This requirement shall not apply to dwelling unit entrance doors; however, such doors shall be tight fitting to the frame and sill.* Protection objective: Establishing permanently suitable laying conditions for preventive sound insulation Quality level 1: Compliance with SBC 1102 Quality level 2: continuous sound insulation enclosure Quality level 3: continuous sound insulation enclosure and pipe routing outside of the wall construction		
	SBC 1102 Section 2602 Section 2603 Section 2902	*Floor/ceiling assemblies between dwelling units or between a dwelling unit and a public or service area within the structure shall have an impact insulation class (IIC) rating of not less than 50 (45 if field tested) when tested in accordance with ASTM E 492.*		

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Establishing permanently suitable laying conditions for preventive sound insulation Quality level 1: Compliance with SBC 1102 Quality level 2: Sound insulation enclosure in penetration area Quality level 3: continuous sound insulation enclosure and pipe routing outside of the wall construction		
Structure entries		Pipe penetrations from the ground into the structure are to be made elastic (resilient) and permanently leaktight at the penetration point. Rigid setting in concrete is not allowed. Protection objective: Establishing permanently suitable laying conditions for waterproofing/dampproofing	Check and document whether the pipe penetrations have been made resilient and leaktight	
Wall and ceiling penetrations (in the building)		Pipe penetrations of structure waterproofing places must be elastic and permanently leaktight. Protection objective: Establishing permanently suitable laying conditions for waterproofing/dampproofing	Check and document whether the pipe penetrations have been made resilient and leaktight	
Dimensioning, minimum sizes				

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Dimensioning	SBC 1102 Section 2602 Section 2603 Section 2902	*Drainage fixture unit values as given in **Table 4.9.1** designate the relative load weight of different kinds of fixtures that shall be employed in estimating the total load carried by a soil or waste pipe, and shall be used in connection with Tables 4.10.1(1) and 4.10.1(2) of sizes for soil, waste and vent pipes for which the permissible load is given in terms of fixture units.* Protection objective: Establishing permanently suitable laying conditions for securing function	Check and documents, whether the requirements in accordance with Table 4.9.1 have been complied with	
		*The maximum number of drainage fixture units connected to a given size of building sewer, building drain or horizontal branch of the building drain shall be determined using **Table 4.10.1(1)**. The maximum number of drainage fixture units connected to a given size of horizontal branch or vertical soil or waste stack shall be determined using **Table 4.10.1(2)**.* Protection objective: Establishing permanently suitable laying conditions for securing function	Check and documents whether the requirements in accordance with Table 4.10.1 (1) + (2) have been complied with	
		*Horizontal stack offsets shall be sized as required for building drains in accordance with **Table 4.10.1(1)**, except as required by Section 4.11.4.* Protection objective:	Check and documents whether the requirements in accordance with Table 4.10.1 (1) have been complied with	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Establishing permanently suitable laying conditions for securing function		
Ventilation				
Main ventilation		*Every building in which plumbing is installed shall have at least one stack the size of which is not less than one-half of the required size of the building drain. Such stack shall run undiminished in size and as directly as possible from the building drain through to the open air or to a vent header that extends to the open air.* Protection objective: Establishing permanently suitable laying conditions for securing function	Check and document whether adequate ventilation has been installed	
		The plumbing system shall be provided with a system of vent piping that will permit the admission or emission of air so that the seal of any fixture trap shall not be subjected to a pneumatic pressure differential of more than 250 Pa. Protection objective: Establishing permanently suitable laying conditions for securing function	Check and document whether the odour traps remain filled with at least 25 mm water seal height during normal operation	
		The minimum required diameter of stack vents and vent stacks shall be determined from the developed length and the total of drainage fixture units connected thereto in accordance with Table 5.16.1, but in no case shall the diameter be less than one-half the diameter of the drain served or less than 32 mm.	Check and document whether the requirements in accordance with Table 5.16.1 have been complied with	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Establishing permanently suitable laying conditions for securing function		
Air recirculation, secondary ventilation		*A maximum of eight fixtures connected to a horizontal branch drain shall be permitted to be circuit vented. Each fixture drain shall connect horizontally to the horizontal branch being circuit vented. The horizontal branch drain shall be classified as a vent from the most downstream fixture drain connection to the most upstream fixture drain connection to the horizontal branch.* Protection objective: Establishing permanently suitable laying conditions for securing function	Check and document whether the maximum 8 discharge points have been grouped together.	
Plumbing fixtures				
Water Closets *a la franca (European) / a la turca (squatting WC pan)*		Wall-hung (concealed (in-wall) flush tank) and floorstanding (top-mounted cistern) In general, with water connection for manual anal cleaning and floor waste outlet Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the toilet body has been installed with structure-borne sound insulation - Check and document whether the system connections are leaktight. Check and document, whether the toilet body has been adequately fixed - Check and document whether the correct flushing and discharge function exists	
Urinals		In general, not included in standard housing		
Bidets		Standard in the main bathroom Protection objective:	- Check and document whether the bidet body has been installed with structure-borne sound insulation	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Establishing permanently safe to use and reliable function	- Check and document whether the system connections are leaktight. Check and document, whether the bidet body has been adequately fixed - Check and document whether the correct flushing and discharge function exists	
Bathtubs		Standard in the main bathroom Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the bathtub has been installed with structure-borne sound insulation - Check and document whether the system connections are leaktight. Check and document, whether the bath tub drains completely, noise-free, within 6 minutes	
Whirlpool bathtubs		Optionally in the main bathroom Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the whirlpool bathtub has been installed with structure-borne sound insulation - Check and document whether the system joints have been made leaktight - Check and document whether the whirlpool bathtub drains completely, noise-free, within 6 minutes	
Showers		In general walk-in (no-step) showers, shower tray (liner) made on site Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the shower waste outlet can discharge twice the inlet quantity with no more than 2 cm head at the waste outlet - Check and document whether the system joints have been made leaktight	
Lavatories (Washbasins)		Standard in all sanitary rooms Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the washbasin has been installed with structure-borne sound insulation - Check and document whether the washbasin has been adequately fixed - Check and document whether the system joints have been made leaktight	

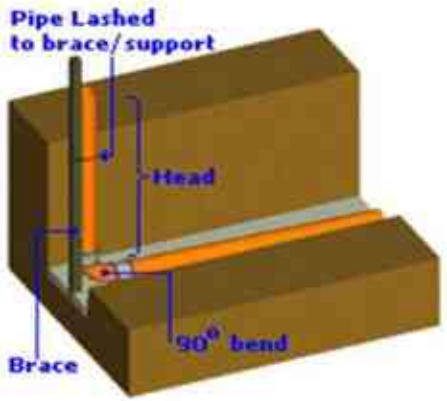
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Sinks		Mostly located in the separate utility room Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the sink has been installed with sound insulation - Check and document whether the system joints have been made leaktight - Check and document whether the sink has been adequately fixed	
Drinking Fountains and Water Coolers		Connection in the kitchen area Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether a connection with own trap exists	
Dishwashing Machines		Mostly located in the separate utility room Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether a connection with own trap exists. Check and document, whether a connection with own trap exists	
Inspections, tests				
Leak test	SBC 1102 Section 2602 Section 2603 Section 2902	*A water test shall be applied to the drainage system either in its entirety or in sections. If applied to the entire system, all openings in the piping shall be tightly closed, except the highest opening, and the system shall be filled with water to the point of overflow. If the system is tested in sections, each opening shall be tightly plugged except the highest openings of the section under test, and each section shall be filled with water, but no section shall be tested with less than a 3 m head of water. In testing successive sections, at least the upper 3 m of the next preceding section shall be tested so that no joint or pipe in the building, except the uppermost 3 m of the system, shall have been submitted to a*	- Check and document whether the required system leaktightness exists	

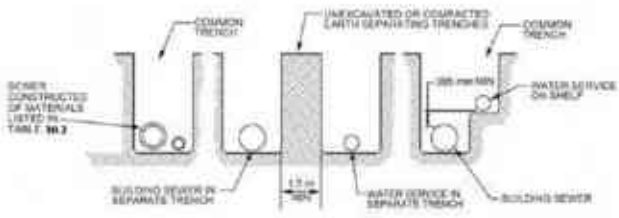
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		test of less than a 3 m head of water. This pressure shall be held for at least 15 minutes. The system shall then be tight at all points. Protection objective: Establishing permanently leaktight execution		
		The final test of the completed drainage and vent system shall be visual and in sufficient detail to determine compliance with the provisions of these requirements SBC 701 except that the plumbing shall be subjected to a smoke test where necessary for cause. Where the smoke test is utilized, it shall be made by filling all traps with water and then introducing into the entire system a pungent, thick smoke produced by one or more smoke machines. When the smoke appears at stack openings on the roof, the stack openings shall be closed and a pressure equivalent to a 250 Pa shall be held for a test period of not less than 15 minutes. Protection objective: Establishing permanently leaktight execution	- Check and document whether the required system leaktightness exists	
Function test		Simultaneous use of the discharge points Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether all discharge points of an apartment/house simultaneously and noise-free	
Operating safety and reliability		Pipe system kept free from contamination through flushing	- Check and document whether the whole pipe system and plumbing fixtures have been adequately flushed and all deposits from the construction period have been removed	

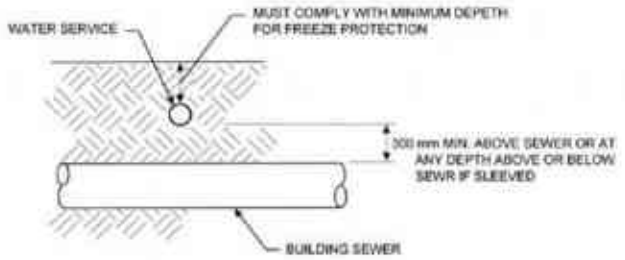
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Operating instructions		For pumps, odour traps, waste outlets Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether appropriate operating instructions, suitably worded for ordinary persons, are available	

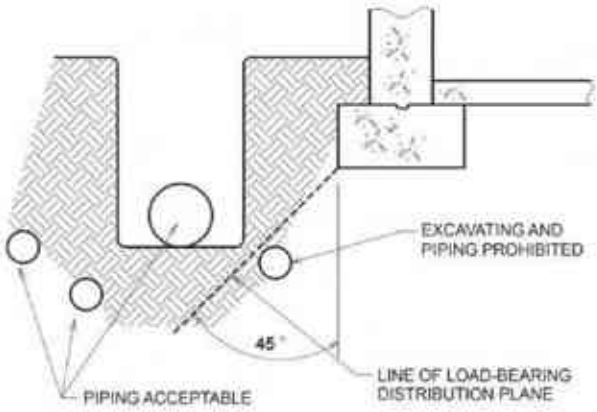
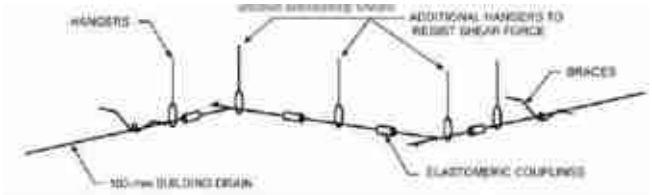
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Inspection and testing **SBC 1102** **Section 2503** **Section 2602** **Section 2609** **Section 2903**	**Materials of piping**		
	Plastic pipe, fittings and components: **Plastic** pipe, fittings and components shall be third-party certified as conforming to **NSF 14.** **Water supply systems:** Water service pipes, water distribution pipes and the necessary connecting pipes, fittings, control valves, faucets and appurtenances used to dispense water intended **for human ingestion** (potable water) shall be evaluated and listed as conforming to the requirements of **NSF 61.** **Plastic** piping systems, fittings and related components intended for **use with the potable water supply** system must comply with **NSF 14 in addition to NSF 61.** .	• Are plastic pipe, fittings, and components third-party certified as conforming to NSF 14? • Are potable water pipes, fittings, control valves, faucets and appurtenances evaluated and listed as conforming to the requirements of NSF 61?	
	Water distribution system		
	The **maximum water pressure** shall be not greater than **550 kPa.** Where the main pressure **exceeds 550 kPa** an approved **pressure-reducing valve** shall be installed on the **domestic water branch** main or riser at the connection to the water service pipe**.** **Public water supply or sewer system:** The water-distribution and drainage system of any building or premises where plumbing fixtures are installed shall be **connected to a public water supply or sewer system**, respectively, if available.	• Is a pressure-reducing valve installed where the main water pressure exceeds 550 kPa? • Does the maximum water pressure exceed 550 kPa? • Is the water supply system connected to the public water-supply, or to an individual water supply? • Is the sewer system connected to the public sewers, or to individual (private) sewage-disposal system?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Where either a public water-supply or sewer system, or both, **are not available**, or connection to them is not feasible, an **individual water supply or individual (private) sewage-disposal system, or both, shall be provided.**		
	Testing		
	Concealment: A plumbing or drainage system, or part thereof, **shall not be covered**, concealed or put into use until it has been: • tested, • inspected and • approved by the building official. **Responsibility of permittee**: Test equipment, materials and labor shall be furnished by the **permittee.** **Building sewer testing (wastewater piping outside the building):** The building sewer shall be tested by: 1) Insertion of a **test plug** at the point of connection with the public sewer, 2) Filling the building sewer **with water** and 3) Pressurizing the sewer to **not less than 3-m head of water (35 KPa).** The test pressure shall not decrease during a period of not less than **15 minutes.** The building sewer shall be watertight at all points. Why **3-m head of water**?	• Is the plumbing or drainage system tested and proved tight under a water pressure by a third party? • Is the water-supply system tested and proved tight under a water pressure by a third party?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	The piping must be pressurized to not less than 35 kPa greater than **the rating of the pump** that creates the pressure to **move the sewage to the public sewer.** **Water-supply system testing:** Upon completion of the water-supply system or a section of it, the system or portion completed **shall be tested and proved tight under a water pressure** of: • Not less than the working pressure of the system (550 kPa) or, • for piping systems **other than plastic**, by an **air** test of not less than **345 kPa.** • This pressure shall be held for not less than **15 minutes**. The water used for tests shall be obtained from a **potable water source**.		  Sewer piping 3-m head testing

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Water-supply system testing
Installation of plumping pipes **SBC 1102** **Section 2906** **Section 2604** **Section 2605**	**Water service and building sewer systems outside the building**		
	Separation of water service and building sewer: Where water service piping is located in the **same trench** with the building sewer, such sewer shall be: • Constructed of materials listed in **Table 30-2** (SBC 1102). • Where the building sewer piping is **not** constructed of materials indicated in Table 30-2, the water service pipe and the building sewer shall be: ○ **Horizontally separated** by not less than **1.5 m** of undisturbed or compacted earth, or ○ The bottom of the water service pipe that locate within **1.5 m** of the sewer is not less than **300 mm above the highest point** of the top of the building sewer. ○ The water service is **sleeved** to a point not less than **1.5 m** horizontally from the sewer pipe centerline on both sides of such crossing.	• Are water service and building sewer piping system separated as per the code requirements? • Are footings protected from trenching installed parallel to footings and walls?	 SEPARATION OF WATER SERVICE AND BUILDING SEWER (Copy SBC 1102, page 703)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Protection of footings: Trenching installed parallel to footings and wall **shall not extend** into the **bearing plane** of a footing or wall. The upper boundary of the bearing plane is a line that extends downward, at an angle of **45 degrees** from horizontal, from the outside bottom edge of the footing or wall.		 Table 30-2 UNDERGROUND BUILDING DRAINAGE AND VENT PIPE PIPE / STANDARD (Copy SBC 1102, page 749)  WATER SERVICE CROSSING OVER BUILDING SEWER (Copy SBC 1102, page 704)

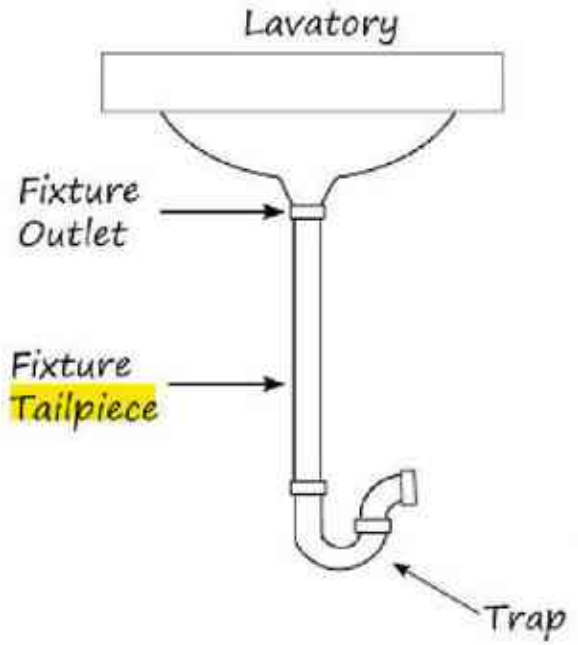
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 EXCAVATION IN RELATION TO FOOTING (Copy SBC 1102, page 566)
	Piping support		
	Piping shall be supported **at distances not** to exceed those indicated in **Table 26-1.** The **intent of supporting** the pipe is to maintain: ○ Proper **slope** and **alignment** and ○ To prevent **sagging**, while ○ Allowing movement of the pipe resulting from **expansion and contraction.** **Hangers and anchors** shall be: 1) of sufficient **strength** to maintain their proportional share of the **weight** of pipe and contents and 2) of sufficient **width** to prevent **distortion to the pipe**.	• Is piping supported at distances not to exceed those indicated in Table 26-1? • Are hangers and anchors of sufficient strength and of sufficient width installed? • Are hangers and strapping of approved material that will not promote galvanic action? • Is rigid support sway bracing provided at changes in direction greater than 45 degrees for pipe sizes 100 mm and larger?	 (Copy SBC 1102, page 567)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Hangers and strapping shall be of approved material that will not promote **galvanic action.** Rigid support **sway bracing** shall be provided at c**hanges in direction greater than 45 degree**s for pipe sizes 100 mm and larger.		 Table 26-1 PIPING SUPPORT (Copy SBC 1102, page 556)  Rigid support sway bracing

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Waterproofing of openings **SBC 1102** **Section 2607**	**Pipes penetrating exterior walls**		
	Where a pipe penetrates an exterior wall, a **waterproof** seal shall be made on the exterior of the wall **by one of** the following methods: 1. A waterproof sealant applied at the joint between the wall and the pipe. 2. A flashing of an approved elastomeric material.	• Are pipe penetrating an exterior wall, a **waterproof** seal?	
	Pipes penetrating roofs.		
	Where a pipe penetrates a roof, an approved **elastomeric material** shall be installed in manner that prevents water entry into the building.	• Are pipe penetrating a roof, a **waterproof** seal?	
Plumbing Fixtures **SBC 1101** **Section 306** **Section 308** **SBC 1102** **Chapter 27**	**Dwelling unit minimum independent living facilities**		

	Toilet facilities:
	Every **dwelling unit** shall be provided with a:
	• water closet,
	• lavatory, and
	• bathtub or shower.
	
	Kitchen:
	Each **dwelling unit** shall be provided with a **kitchen area** and every kitchen area shall be provided with a **sink**.
	
	Hot and cold water:
	• Plumbing fixtures shall be connected to an approved water supply.
	• The following shall be provided with hot and cold-water outlets:
	  ○ Kitchen sinks,
	  ○ lavatories,
	  ○ bathtubs,
		• Does the dwelling unit provide the minimum independent living facilities?
		• Is the kitchen area provided with a sink?
		• Are plumbing fixtures connected to an approved water supply?
		• Are plumbing fixtures provided with hot and cold-water outlets?
		• Are plumbing fixtures connected to a sanitary sewer or an approved private sewage disposal system?
			Dwelling unit is a single unit providing:
			• complete independent living facilities
			• for one or more persons,
			including permanent provisions for living, sleeping, eating, cooking and sanitation.

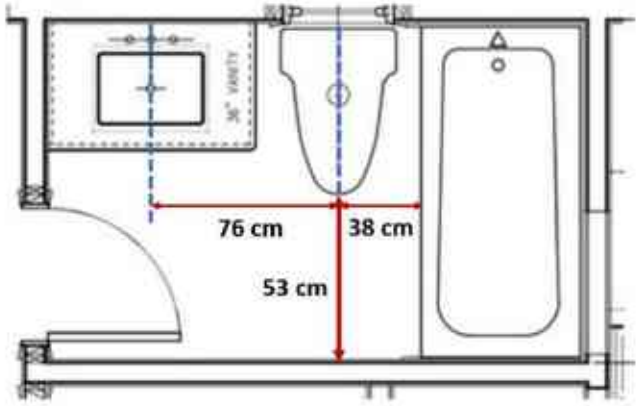
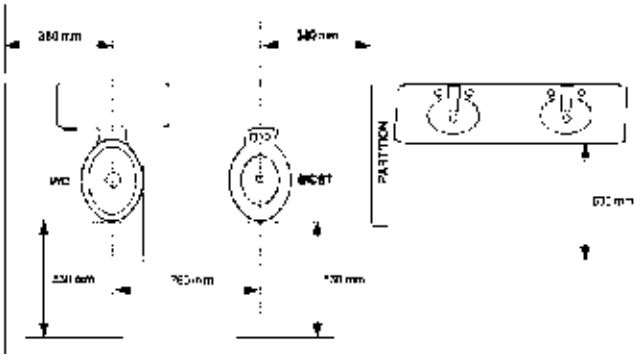
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	○ showers, ○ bidets, ○ laundry tubs and ○ washing machine. **Sewage disposal:** Plumbing fixtures shall be connected to: • a sanitary sewer or • an approved private sewage disposal system.		
	Plumbing fixtures strainers		
	Plumbing fixtures, **other than water closets**, shall be provided with approved strainers. This requirement prevents items such as toothbrushes, rings, cosmetic devices and large food waste particles from **entering the drainage** system and **creating clogs**.	• Are plumbing fixtures provided with approved strainers?	
	Drainpipes minimum size		
	Fixture tail pieces shall be **not less than 30 mm** in **diameter** for: • bidets, • lavatories, and • similar fixtures. Where: • sinks, • dishwashers,	• Are bidets, lavatories, and similar fixtures tail pieces diameter less than 30 mm? • Are sinks, dishwashers, laundry tubs, bathtubs, and similar fixtures tail piece diameter less than 40 mm? • Are shower drains outlet size of less than 40 mm in diameter?	**Tail piece** of a fixture is the drain tube **immediately** downstream of the fixture waste outlet opening and upstream of the fixture trap.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• laundry tubs, • bathtubs and • similar fixtures must have a tail piece **diameter** that is **not less than 40 mm.** **Shower drains** shall have an outlet size of not less than **40 mm in diameter**.		

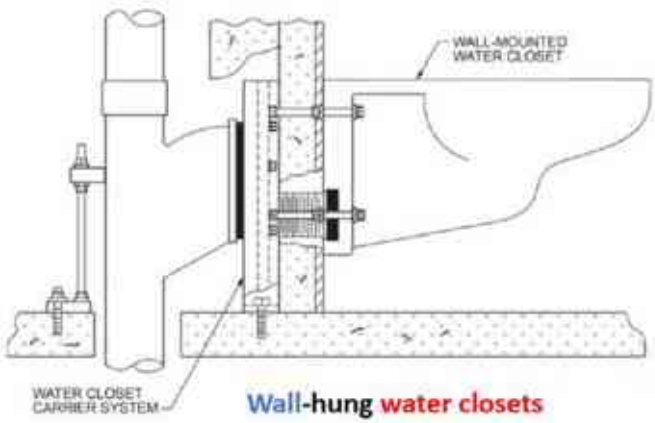
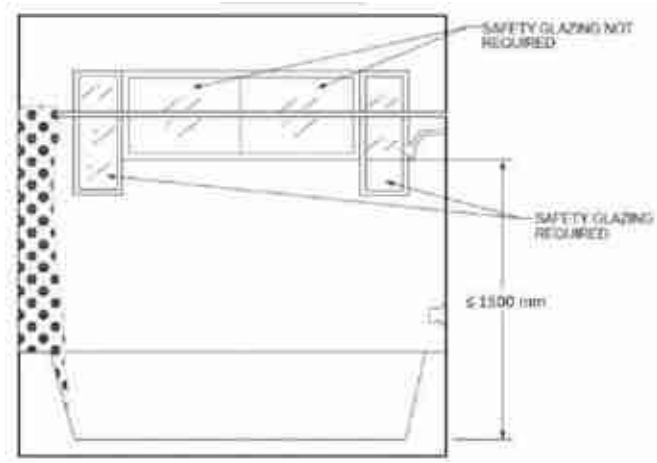
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 *Plumbing Fixtures* 

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Plumbing fixtures installation		

	• Where fixtures come in contact with **walls and floors**, the contact area shall be **watertight**.
	• Plumbing fixtures shall be **usable**.
	
	Water closets, lavatories and bidets:
	• A water closet, lavatory or bidet shall not be set closer than **380 mm** from **its center** to:
	  ○ any side wall,
	  ○ partition or
	  ○ vanity or
	• closer than **760 mm** center-to-center between **adjacent fixtures**.
	
	• There shall be a clearance, to any wall, fixture or door, of not less than **530 mm** in front of a:
	  ○ Water closet,
	  ○ Lavatory or
	  ○ Bidet.
	
	• The location of piping, fixtures or equipment **shall not interfere** with the operation of **windows or doors.**
	
	• **Wall-hung water closets** must be **rigidly supported** using specially designed carriers that are securely fastened to the floor structure behind the wall.
		• Is the connection between walls, floors and fixtures watertight?
		• Are all plumbing fixtures usable?
		• Are water closet, lavatory or bidet not being closer than 380 mm from its center to any side wall, partition, or vanity?
		• Are water closet, lavatory or bidet not being closer than 760 mm center-to-center between each other's?
		• Is the clearance, to any wall, fixture or door, not less than 530 mm in front of a: water closet, lavatory or bidet?
		• Do piping, fixtures or equipment interfere with the operation of windows or doors?
		• Are wall-hung water closets rigidly supported?
			
			(Copy SBC 1102, page 591)
			 

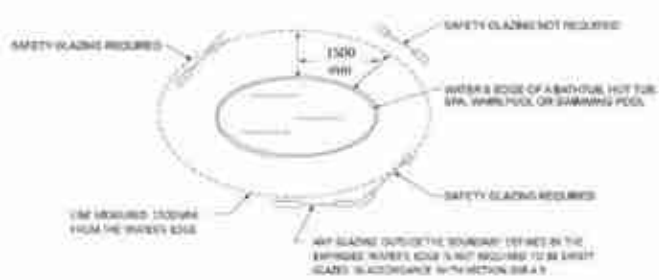
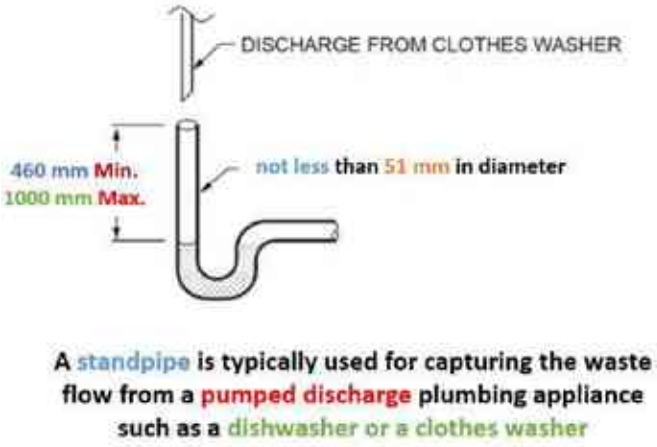
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			  (Copy SBC 1102, page 592)

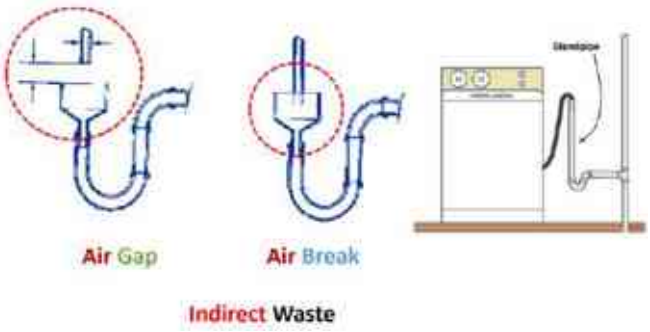
			 *Plumbing fixtures installation mistakes* 

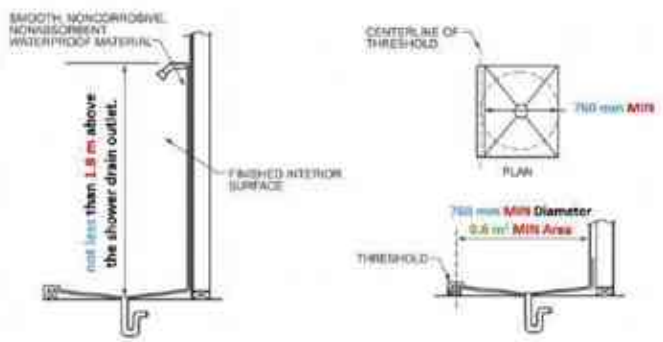
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1102, page 590)
	Installation of glazing in wet areas		
	Glazing in wet surfaces: Glazing in walls, enclosures or fences containing or facing: • Hot tubs, • Spas, • Whirlpools, • Saunas, • Steam rooms, • Bathtubs, • Showers, and • Indoor or outdoor swimming pools where the **bottom exposed edge** of the glazing is **less than 1500 mm** measured **vertically** above any standing or walking surface shall be considered to be **hazardous location.** This shall apply to single glazing and each pane in multiple glazing.	• Is window glazing intalled in hazardous location, a saftey glass? • Is the safety glass tested in accordance with CPSC 16 CFR 1201 or ANSI Z97.1? • Is the manufacturer's designation and identification of glazing provided on each pane of glazing?	 (Copy SBC 1101, page 210)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes

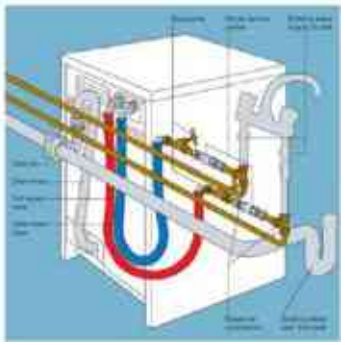
	Exception:
	Glazing that is **more than 1500 mm**, measured **horizontally** and in a straight line, from the **water's edge** of:
	• A bathtub,
	• Hot tub,
	• Spa,
	• Whirlpool or
	• Swimming pool or
	• from the edge of
	  ○ A shower,
	  ○ Sauna or
	  ○ Steam room.
			If the gazing is intalled in **hazardous location, t**hen the glazing must be **Saftey Glass**.
			
			What is a Saftey Glass?
			Is glazing that can pass "Impact test" where glazing shall be tested in accordance with:
			7) **CPSC 16 CFR 1201** or
			8) ANSI Z97.1
			
			NOTE:
			Glazing in doors or enclosures for hot tubs, whirlpools, saunas, steam rooms, bathtubs and showers **shall not** be permitted to be tested in accordance with ANSI Z97.1
			
			 
			(Copy SBC 1101, page 211)
			
			Identification:
			Each pane of glazing installed in **hazardous locations** as defined **below** shall be provided with:
			• a manufacturer's designation
			• specifying who applied the designation,
			• designating the type of glass and
			• the safety glazing standard with which it complies, which is visible in the final installation.
			
			The designation shall be:
			• acid etched,
			• sand-blasted,

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			• ceramic-fired, • laser etched, • embossed, or • be of a type that once applied cannot be removed without being destroyed.  (Copy SBC 1101, page 211)
	Standpipes		
	Standpipes shall be **not less than 51 mm** in **diameter.** Standpipes shall extend: • Not less than **460 mm** and • Not greater than **1000 mm** above the trap weir. **Why** not less than **460 mm?** 1. If the appliance discharges at a greater rate than the trap is discharging to the fixture drain, the accumulated volume will not spill out the top of the standpipe. 2. The accumulation of waste volume above the entry of the trap also creates a small amount of head pressure on the trap inlet to make the trap pass the waste flow at a higher rate.	• Are standpipes less than 51 mm in diameter? • Are standpipes extend not less than 460 mm and not greater than 1000 mm above the trap weir? • Is the laundry tray waste line connection into a standpipe for an automatic clothes washer drain comply with the code requirements? • Is the discharge from clothes washing machine through an air-break?	 (Copy SBC 1102, page 593-Modifed)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Why not greater than **1000 mm?** The limitation on the maximum height of a standpipe is so the falling wastewater does not gain **too much velocity**, which might cause the trap to **self-siphon**. Standpipes and the traps for standpipes can be **concealed within construction**, but the inlet to the standpipe must be accessible to allow drain cleaning. **Laundry tray connection to standpipe:** Where a laundry tray waste line connects into a standpipe for an automatic clothes washer drain: 1. The standpipe shall extend not less than **760 mm above** the standpipe trap weir and shall extend above the flood level rim of the laundry tray. 2. The outlet of the laundry tray shall **not** be greater than **760 mm** horizontally from the standpipe trap. **Waste connection:** The discharge from clothes washing machine shall be through **an air-break.**		A self-siphon is a way to carry water uphill without the use of pumps. A combination of gravity and atmospheric pressure drives the wastewater in the reverse direction of the standpipe (uphill).  **Laundry tub connection to standpipe** (Copy SBC 1102, page 594-Modifed) 

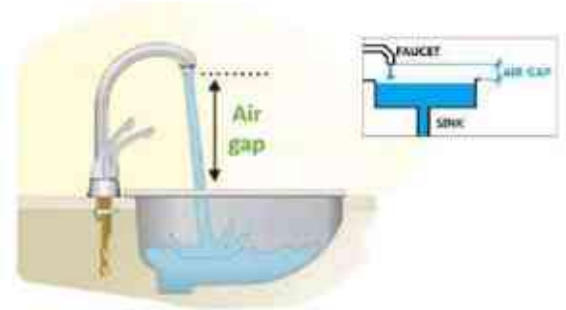
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	SHOWERS		
	Shower compartments shall have: 1. not less than **0.6 m²** of interior cross-sectional area. 2. Shower compartments shall be not less than **760 mm** in minimum dimension measured from the finished interior dimension of the shower compartment, **exclusive** of: • fixture valves, • shower heads, • soap dishes, and • safety grab bars or rails. 3. **Hinged** shower doors shall open **outward**. 4. The shower compartment access and egress opening shall have a **clear** and **unobstructed** finished width of **not less than 560 mm.** **Exception:** Shower can have an interior dimension of less than 760 mm, but not less than **635 mm** as long as the **area** of the shower is not less than **0.85 m²**. This exception is necessary for replacing a standard size bathtub [typically 760 mm by 1500 mm)] with a shower compartment. The minimum required area and dimension of shower compartment **shall be measured** from: ▪ The finished interior dimension ▪ At a height equal to the top of the **threshold** and ▪ At a point tangent to its centerline and ▪ Shall be continued to a height of not less than **1.8 m** above the **shower drain outlet**. The wall area:	• Is the shower compartments interior cross- sectional area less than 0.6 m²? • Is the shower compartments less than 760 mm in minimum dimension? • Is the shower compartment access and egress opening less than 560 mm? • Is the shower head riser anchored with screws into a structural member?	 Shower compartments Min. dimensions (Copy SBC 1102, page 594-Modifed)  Securing shower riser (Copy SBC 1102, page 595)

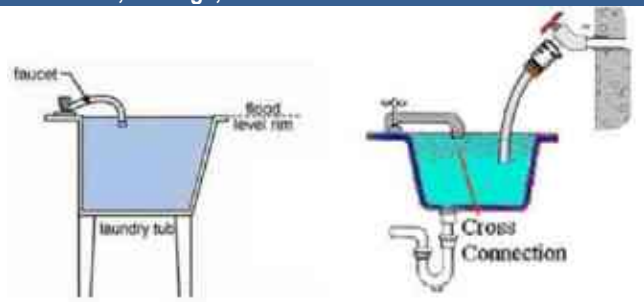
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• above built-in tubs having installed shower heads and • in shower compartments shall be constructed of: ▪ soft, ▪ non-corrosive and ▪ non-water absorbent material. Such walls shall form a **water-tight joint** with each other and with either the tub, receptor, or shower floor. **Shower head riser installation:** • The shower head riser must be **attached to a building structural** element to protect the pipe and shower valve from damage caused by shower head movement. • Users commonly put force on the shower head arm when they adjust the spray pattern, therefore the water supply riser shall be **anchored with screws** into a structural member.		
	BATHTUBS		
	Bathtubs shall be equipped with: 1. A waste outlet and 2. An overflow outlet. The outlets shall be connected to waste tubing or piping not less than **40 mm** in diameter. The waste outlet shall be equipped with a **water-tight stopper.**	• Are bathtubs equipped with a waste outlet and an overflow outlet? • Are bathtubs outlets connected to waste tubing or piping not less than 40 mm in diameter? • Are bathtubs outlets equipped with a water-tight stopper?	 Bathtub waste outlets and overflows

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Dishwasher		
	Protection of water supply: The **water supply** shall be protected against **backflow** by **an:** 1. **air gap** that is installed integrally within the machine **(inside the machine)** or 2. A **backflow preventer** external to the machine.	• Is the dishwasher water supply protected against backflow?	 
	Floor drains.		
	• Floor drains shall have: ○ Waste outlets not less than **50 mm** in diameter ○ A removable strainer. • Floor drains shall be constructed so that the drain can be cleaned. • Access shall be provided to the drain inlet. • Floor drains shall not be located **under** or have their access restricted by permanently installed **appliances**.	• Are floor drains waste outlets less than 50 mm in diameter? • Are floor drains waste outlets equipped with removable strainer? • Are floor drains located under or have their access restricted by permanently installed appliances? • Are floor drains constructed so that the drain can be cleaned?	 Floor drains

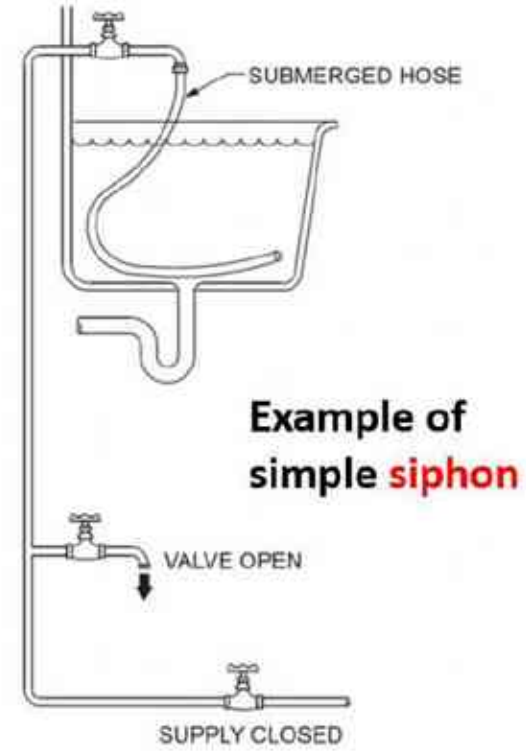
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Whirlpool bathtub		
	Accessibility to the pump: • Access shall be provided to circulation pumps in accordance with the fixture or pump manufacture installation instructions. • An opening of not less than **300-mm by 300-mm** shall be installed for access to the circulation pump. • Where pumps are located more than **610 mm from the access** opening, an opening of not less than **460 mm by 460** mm shall be installed.	• Is an access provided to circulation pumps of whirlpool bathtub in accordance with the manufacture installation? • Is the access opening comply with the code requirements?	 Whirlpool bathtubs
	Fixture supply valves		
	Fixture supply valves and faucets that supply **drinking water** for human ingestion shall conform to the requirements of **NSF 61, Section 9.** (comply with ASME A112.18.1/CSA B125.1).	• Are fixture supply valves and faucets that supply drinking water for human ingestion conform to the requirements of NSF 61?	 Fixture supply valves Faucets
Water supply system **SBC 1102** **Chapter 29**	**Potable Water Protection from contamination**		
	The code requires potable water to be supplied to dwelling units, and contains specific guidelines for maintaining the **potability** of the water supply. These provisions are for protecting the water system from **contamination.**		

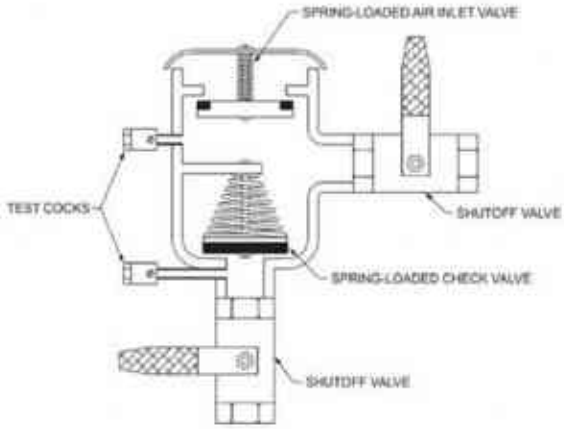
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Identification of nonpotable water systems: Where **non**potable water systems are installed, the piping conveying the **non**potable water **shall be identified** either by: • color marking, • metal tags or • tape. **The color** of the pipe identification shall be discernable and **consistent** throughout the building. **The color purple** shall be used to identify: • Reclaimed, • Rain and • Gray water distribution systems. **Lettering size**: The length of the background color field and lettering shall comply with **Table 29-1.** **On-site reuse systems of unusable water:** Construction, installation, alteration and repair of **on-site nonpotable water reuse systems** shall be in accordance with section **2911 of SBC 1102**. **Rainwater collection and distribution systems:** Construction, installation, alteration, and repair of rainwater collection and conveyance systems for the collection, storage, treatment, and distribution of **rainwater for nonpotable applications** shall be in accordance with section **2912 of SBC 1102.**	• Are nonpotable water systems identified either by color marking, metal tags or tape? • Is the color of reclaimed, rain and gray water distribution systems purple? • Is the on-site nonpotable water reuse systems in accordance with section 2911 of SBC 1102? • Is the rainwater collection and conveyance systems for nonpotable applications in accordance with section 2912 of SBC 1102? • Is the nonpotable reclaimed water in accordance with section 2913 of SBC 1102?	 "CAUTION: NONPOTABLE WATER. DO NOT DRINK." Example of **non**potable water, a building could be provided with a **recycled gray-water** supply system that supplies **non**potable water for **flushing urinals and water closets.**  The color purple **shall be used to** identify reclaimed, rain and gray water **distribution systems.** Table 29-1 SIZE OF PIPE IDENTIFICATION PIPE DIAMETER (mm) / LENGTH OF BACKGROUND COLOR FIELD (mm) / SIZE OF LETTERS (mm) (Copy SBC 1102, page 682)

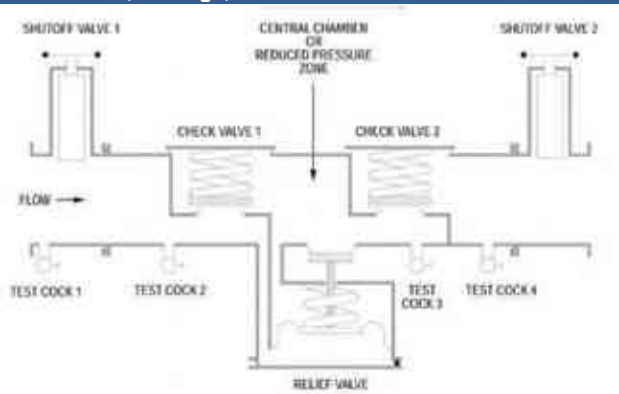
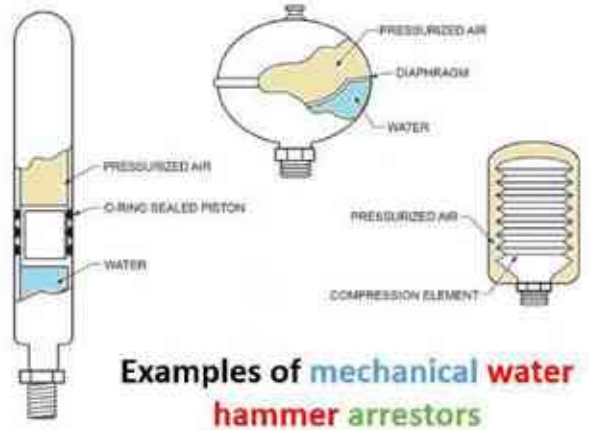
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Reclaimed water systems: Construction, installation, alteration, and repair of systems supplying **nonpotable reclaimed water** shall be in accordance with section **2913 of SBC 1102.**		
	History is filled with localized and widespread occurrences of sicknesses, diseases and deaths caused by contamination of potable water supplies. It is therefore imperative that potable water supply systems be designed and maintained in a safe-for-drinking condition at all times. Although the requirements of this section appear straightforward, piping arrangements, fixture designs and appliance operations can be complex. Adding to this complexity is the potential for upset conditions to occur with regard to pressures within piping systems. As a result, designers and installers of potable water systems must be **aware of hazardous conditions that might occur** because of **connections** made to potable water systems or changing pressure conditions within piping systems that would not be normally expected. **Protect the potable water supply:** A potable water supply system shall be designed and installed as to **prevent contamination from nonpotable liquids,** **solids or gases** being introduced into the potable water supply. **Connections** shall not be made to a potable water supply in a manner that could contaminate the water supply or provide a **cross-connection** between the supply and a source of contamination.	• Are connections to a potable water supply protected against backflow?	 **A cross-connection** is defined as any physical connection or arrangement between **potable water** and **any source of contamination**. Examples of cross-connections in dwelling units: Where a lavatory or laundry tub has: • A faucet or • A hose **below** the top of the laundry tub or lavatory **flood level**. Thus, it is possible that when the tub is filled, the faucet/hose will be **submerged**, and a b**ackflow could happen** which may **contaminate potable** water. The same thing can happen with the garden Hose cross connections, it is possible for the contaminated water to flow back through the hose into the potable water.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Cross-connections between an **individual** water supply and a potable **public** water supply **shall be prohibited**. **Backflow protection:** A means of protection against backflow shall be provided through: 1. **Air gaps**: the required air gap shall be according to **Table 29-3**. 2. **Atmospheric-type vacuum breakers**: Both types of vacuum breakers: a. Atmospheric-type vacuum breakers. b. Hose- connection vacuum breakers shall be installed with the outlet continuously **open to the atmosphere.** 3. **Backflow preventer with intermediate atmospheric vent**. The relief opening shall discharge by air gap and shall be prevented from being subchard. 4. **Pressure vacuum breaker assemblies**: Pressure vacuum breaker assemblies shall not be installed in locations where spillage could use damage to the structure. 5. **Reduced pressure principal backflow prevention assemblies**. The relief opening shall discharge by air gap and shall be prevented from being subchard. **6. Double check backflow prevention assemblies.** 7. **Dual check backflow preventer**.		 Cross-connections in lavatory or laundry tub This problem can be fixed by creating an **"air gap"** (**25 mm Min**.)  Table 29-3 MINIMUM AIR GAPS (Copy SBC 1102, page 683)

FIXTURE	MINIMUM AIR GAP	
	Away from a wall* (mm)	Close to a wall (mm)
Effective openings greater than 25 mm	Two times the diameter of the effective opening	Three times the diameter of the effective opening
Lavatories and other fixtures with effective opening not greater than 12.5 mm in diameter	25	40
Over-rim bath fillers and other fixtures with effective openings not greater than 25 mm in diameter	50	80
Sink, laundry trays, gooseneck back faucets and other fixtures with effective openings not greater than 20 mm in diameter	40	65

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Examples of locations **of cross-connection** between the potable water and a source of contamination are: • Dishwasher cross connections. • Garden hose cross connections. • Clothes washer plumbing cross connection. • A bidet which has a water supply at the bottom of the bowl. • Submerged faucets.		**Backflow** is the flow of liquids in potable water distribution piping that is **in reverse** of its intended direction. Two types of pressure conditions cause backflow: 1. Back siphonage 2. Backpressure.  **Back-siphonage** is a **backflow** of water that is caused by **system pressure falling** below atmospheric pressure. (Copy SBC 1102, page 698)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Pressure vacuum breaker (Copy SBC 1102, page 701)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 Reduced pressure principal backflow preventer (Copy SBC 1102, page 701)
	Water Hammer		
	Water hammer: The flow **velocity** of the water distribution system **shall be controlled** to reduce the possibility of **water hammer**. Water hammer **arrestors** shall be installed in with the **manufacturer's instructions** and shall conform to **ASSE 1010**.	• Are water hammer arrestors installed with the manufacturer's instructions and conform to ASSE 1010?	 Examples of mechanical water hammer arrestors (Copy SBC 1102, page 703)

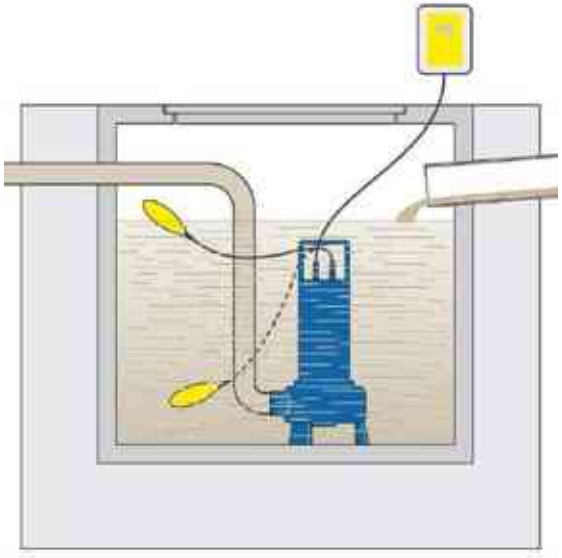
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Service valves		

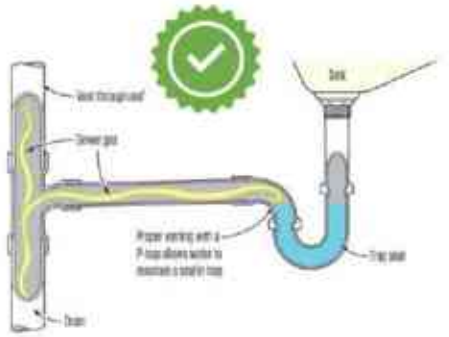
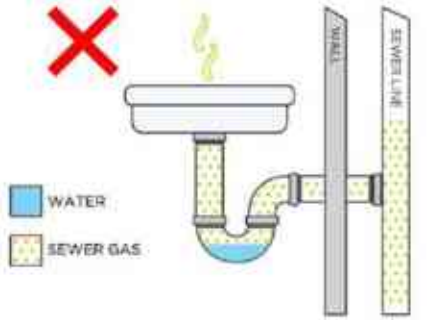
	• Each dwelling unit shall be provided with an accessible **main shutoff valve** near the entrance of the water service. The valve shall be of a **full-open type**.
	• A readily accessible **full-open valve** shall be installed in the supply pipe to each **water heater**.
	• **Shutoff valves** shall be required on each fixture supply pipe to:
	  ○ each plumbing appliance
	  ○ each plumbing fixture
	  ○ other than bathtubs and showers.
	• Valves serving **individual plumbing** fixtures, plumbing appliances, risers and branches shall **be accessible**.
		• Are full-open type valves installed in the entrance of the water service and in the supply pipe to each water heater?
		• Are shutoff valves installed on each fixture supply pipe?
		• Are full-open type valves and shutoff valves accessible?	

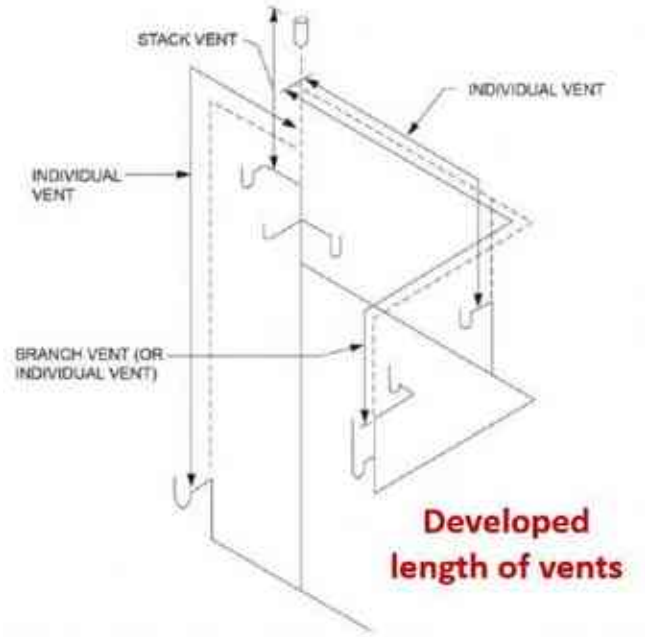
	Drinking water treatment units:		
	Drinking water **treatment units** shall meet the requirements of NSF 42, NSF 44, NSF 53, NSF 60 or CSA B483.1. **Reverse osmosis** drinking water treatment units, designed for **residential use**, shall meet the requirements of NSF 58 or CSA B483.1	• Does the drinking water treatment units meet the approved standards?	
Sanitary drainage **SBC 1102** **Chapter 30**	In the 19th century, typhoid fever, cholera and dysentery were common. **The elimination of these diseases** in industrialized nations has been **due** in large part **to modern plumbing systems** with proper drainage piping. Medical professionals give much of the credit for improvements in health and longevity to the plumbing profession.		

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Medicine alone, without improvements in sanitation practices, would have had only a marginal effect.		 Modern drain-cleaning equipment is available with cable (or jetter hose) length to clear blockages in horizontal drainage piping that is **30 m (or less)** in developed piping **length** from the cleanout opening.
	Plastic piping:		
	PVC plastic: **Joints** between PVC plastic pipe or fittings can be: 1. **Mechanical joints:** shall be made with an elastomeric seal conforming **to ASTM CI 173**. 2. **Solvent cementing**: Joint surfaces shall be clean and free from moisture. 3. **Threaded joints**: threads shall conform to **ASME B1.20.1**	• Are Joints between PVC plastic pipe or fittings made in accordance with approved standards? • Are Joints between polyethylene plastic pipe and fittings made in accordance with approved standards?	 Mechanical joints  Solvent cementing  Threaded joints

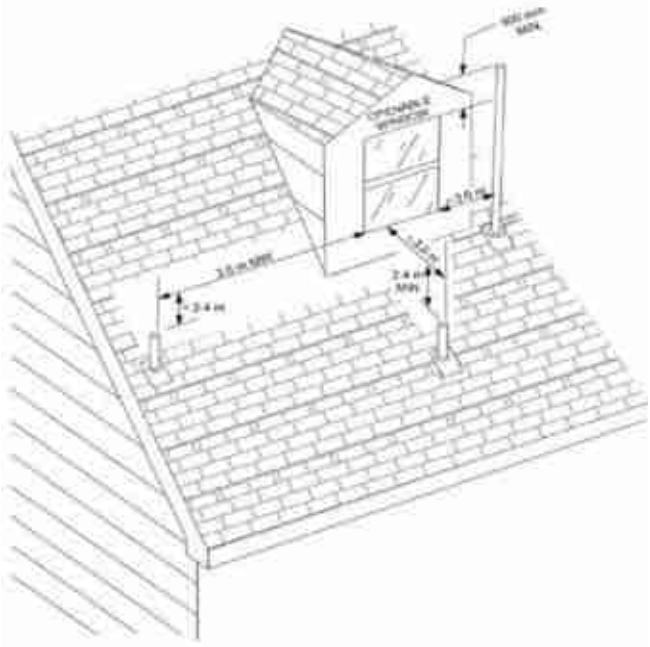
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Polyethylene plastic pipe: **Joints** between polyethylene plastic pipe and fittings can be: 1. **Heat fusion joints:** Joint surfaces shall be-glean and free from moisture. 2. **Mechanical joints:** shall be made with an elastomeric seal conforming to **ASTM CI 173**.		
	Drainage piping slope		
	Horizontal drainage piping slope: Horizontal drainage piping shall be installed in uniform alignment at uniform slopes: 1. **For 60 mm diameter and less**: not less than 1/ 4-unit vertical in 12 units horizontal (**2 percent slope**). 2. **For diameters of 80 mm or more**: not less than 1/8-unit vertical in 12 units horizontal (**1 -percent slope)**	• Is the horizontal drainage piping installed in uniform alignment at uniform slopes?	**Pipe diameter** / **Required slope** **60 mm diameter and less** — not less than **2 percent slope** **80 mm diameter and more** — not less than **1 percent slope** The **minimum** desired velocity in a horizontal drainpipe is approximately **0.6 m/s**. This velocity is often referred to as the "scouring velocity." This minimum velocity is intended to keep solids in suspension. If velocity is too low because the pipe slope is too shallow, the solids will tend to drop out of suspension, settling at the bottom of the pipe. This will ultimately lead to a drain blockage.
	Basement Drainage system		
	SUMPS AND EJECTORS **Building subdrains.** • Building subdrains that **cannot be discharged** to the sewer **by gravity flow** shall be discharged into a tightly covered and vented sump from which the liquid shall be lifted and discharged into the building gravity drainage system by automatic pumping equipment or other approved method.	• Is the building subdrains discharged into a tightly covered and vented sump? • Is the subdrain sump liquid lifted and discharged into the building gravity drainage system by automatic pumping equipment or other approved method? • Is the discharge piping of sump have a check valve?	

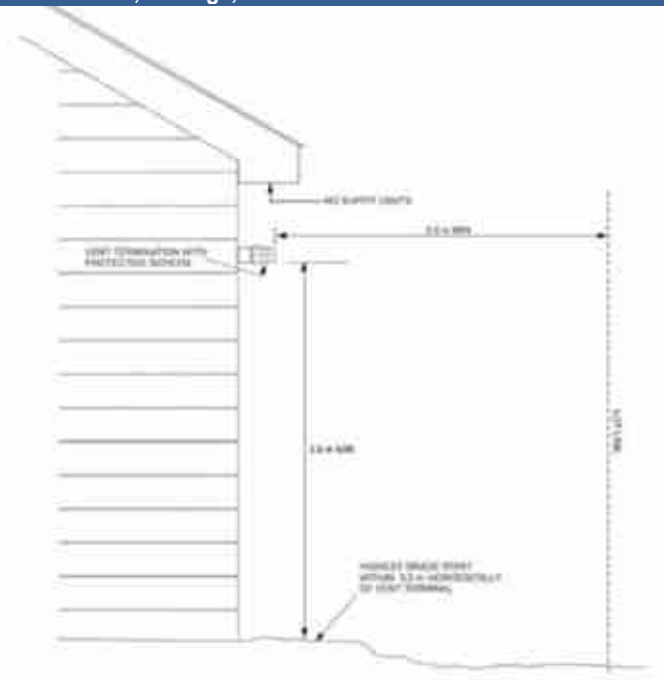
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• In other than existing structures, the sump shall not receive drainage from any piping within the building capable of being discharged by gravity to the building sewer. • The discharge piping must have a **check valve** to prevent the previously pumped waste from returning to the sump pit **when the pump or ejector shuts off.**		 *Basement Drainage system*
Vents **SBC 1102** **Chapter 31**	**Trap seals** • Venting protects the **trap seals** within the plumbing system when it functions properly. Failure in venting system result in the loss of trap seals and the introduction of **sewer gases into the building.** • If there were **no traps** in a drainage system, **venting would not be required** because the system would be open to the atmosphere at the fixture connections, thereby allowing airflow. However, this will result in the introduction of **sewer gases into the building**. • Thus, venting is intended to provide for the circulation of air within the drainage system because the trap seal prevent the system to be ventilated from the fixture connections.	• Is the plumbing system provided with a system of vent piping that will allow the admission or emission of air? • Are all fixture traps liquid sealed?	

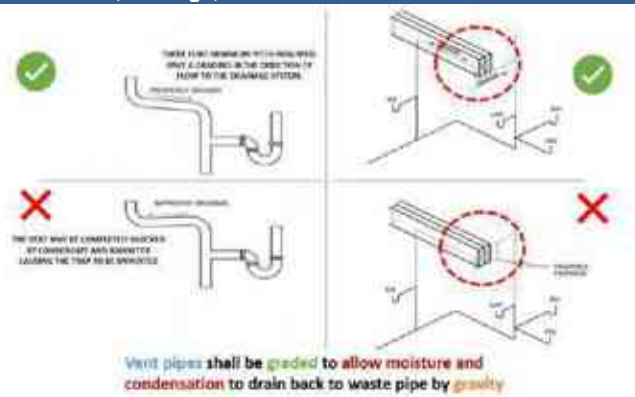
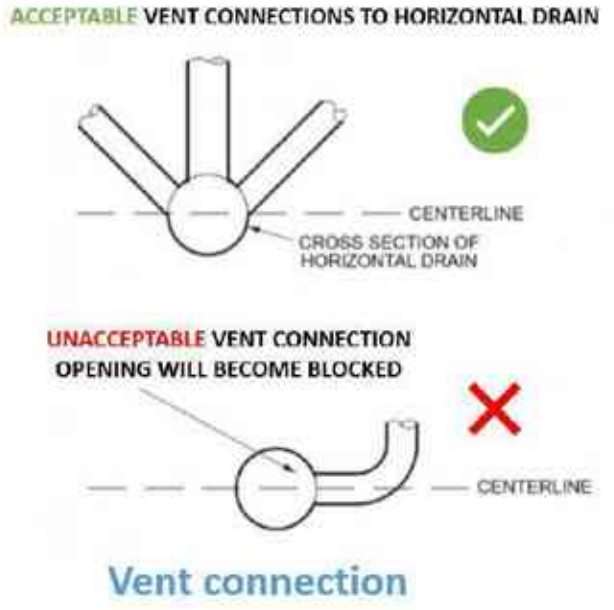
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	The plumbing system shall be provided with a system of vent piping that will allow **the admission or emission of air** so that the **liquid seal** of any fixture trap shall not be subjected to a **pressure differential** of more than **250 Pa.**		  Venting protects the trap seals within the plumbing system.
	VENT STACKS AND STACK VENTS		
	• The vent system serving each building drain shall have **not less than one vent** pipe that extends to **the outdoors**. • The required vent shall be a **dry vent** that connects to the building drain or an extension of a drain that connects to the building drain.	• Is the vent system serving the building drain consist of at least one vent pipe that extends to the outdoors? • Is the vent pipe less than one-half the diameter of the drain served? • Is the vent pipes less than 30 mm in diameter?	

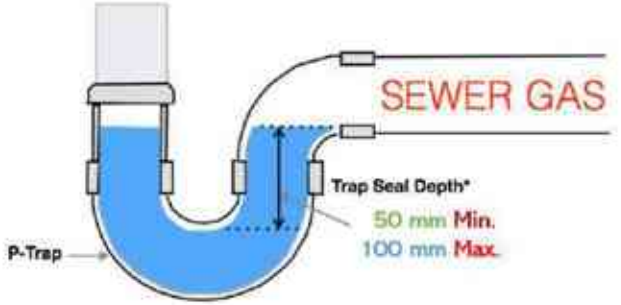
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• The required vent shall not less than **one-half** the required diameter of the **drain served**. • Vent pipes shall be not less than **30 mm in** diameter. • Vents exceeding **12.2 m in developed length** shall be increased by one nominal pipe size for the entire developed length of the vent pipe. • Open vent pipes that extend through a roof shall be terminated: 1. not less than **150 mm** above the roof. 2. not less than **2100 mm** above the roof where a roof is to be used for **assembly, as a promenade, observation deck or sunbathing deck or for similar purposes**. • A vent terminal **shall not be used** for any purpose other than a vent terminal.	• Are open vent pipes that extend through a roof terminated in accordance with the code? • Is a vent terminal used for any purpose other than a vent terminal?	 (Copy SBC 1102, page 798)

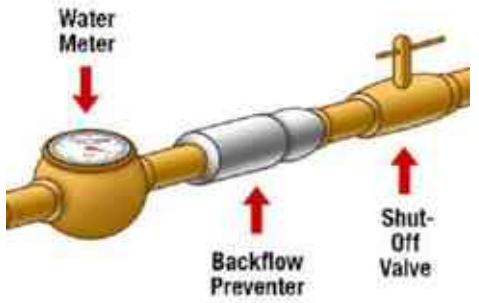
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 *Vent pipes heights*
	Location of vent terminal		
	An **open** vent terminal from a drainage system shall **not be** located less than **1200 mm directly** beneath any: 1. door, 2. openable window, 3. or other air intake opening of the building. 4. or of an adjacent building. 5. Nor shall **any such vent terminal** be within **3000 mm horizontally** of such an opening unless it not less than **900 mm above** the top of such opening. Vent terminals extending through the wall shall terminate: 1. **not** less than **3000 mm** from the lot line and 2. 3000 mm **above** the highest adjacent grade within **3000 mm** horizontally of the vent terminal.	• Are open vents from a drainage system located in accordance with the code?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1102, page 781)

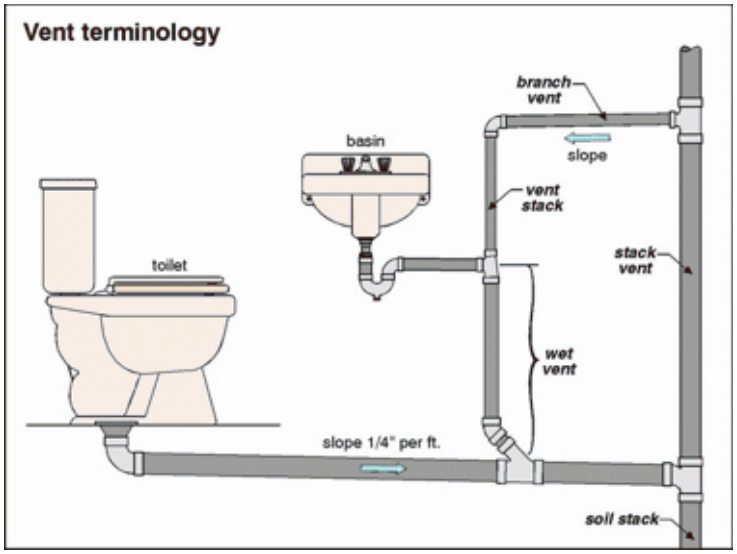
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1102, page 782)
	Vent connections and Grades		
	• Vent and branch vent pipes shall be **graded**, connected, and supported to allow **moisture and condensation to drain back** to the soil or waste pipe by gravity. • A dry vent connecting to a horizontal drain shall connect above the centerline of the horizontal drainpipe.	• Are vent and branch vent pipes graded, to allow moisture and condensation to drain back to the soil or waste pipe by gravity? • Is the dry vent connecting to a horizontal drain above the centerline of the horizontal drainpipe? • Does the dry vent rise vertically to not less than 150 mm above the flood level rim of the highest trap or trapped fixture being vented?	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• A dry vent shall rise vertically to not less than **150 mm** above the flood level rim of the highest trap or trapped fixture being vented.		 (Copy SBC 1102, page 783)  (Copy SBC 1102, page 783)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Traps **SBC 1102** **Chapter 32**	• Each fixture trap shall have a **liquid seal** of not less than **50 mm** and not more than **100 mm**. • Traps shall be **set level** with respect to their water seals. • Trap seals shall be protected from siphonage, aspiration or back pressure by an approved system of venting. • Trap sizes for plumbing fixtures shall be as indicated in **Table 32-1.** • Where the **tailpiece** of a plumbing fixture is larger than that indicated in Table 32-1, the trap size shall be the same nominal size as the fixture tailpiece. • A trap shall not be larger than the drainage pipe into which the trap discharges.	• Are all fixture traps have a liquid seal of not less than 50 mm and not more than 100 mm? • Are traps set level with respect to their water seals? • Are trap sizes for plumbing fixtures in accordance with Table 32-1? • Is the trap larger than the drainage pipe into which the trap discharges?	 Table 32-1 SIZE OF TRAPS FOR PLUMBING FIXTURES PLUMBING FIXTURE | TRAP SIZE MINIMUM (mm) Bathtub (with or without shower head and/or whirlpool) | 40 Bidet | 30 Clothes washer standpipe | 50 Dishwasher (on separate trap) | 40 Floor drain | 50 Kitchen sink (one or two traps, with or without dishwasher and food waste disposer) | 40 Laundry tub (one or more compartments) | 40 Lavatory | 30 Shower (based on the total flow rate through showerheads and body sprays) Flow rate: 21.6 L/min and less | 40 More than 21.6 L/min up to 46.6 L/min | 50 More than 46.6 L/min up to 87.7 L/min | 80 (Copy SBC 1102, page 808)

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Plumbing work - Sanitation - Water - Wastewater	**Sanitation installation** Sanitary drainage system, plumbing fixtures etc.			
	SBC 1102 Section 2602 Section 2603 Section 2902	Sanitary systems		
Physical principles *(independent of the SBC standard, only continuous function due – protection objective consideration)*			Ability to inspect and unobstructed access to the central components	
			No unreasonable noise impact due to operation of the systems, inside and outside of the building	
			Execution of inherently safe supply discharge fittings (faucets), to prevent backflow into the non-potable or drinking water system	 *Backflow Preventer*

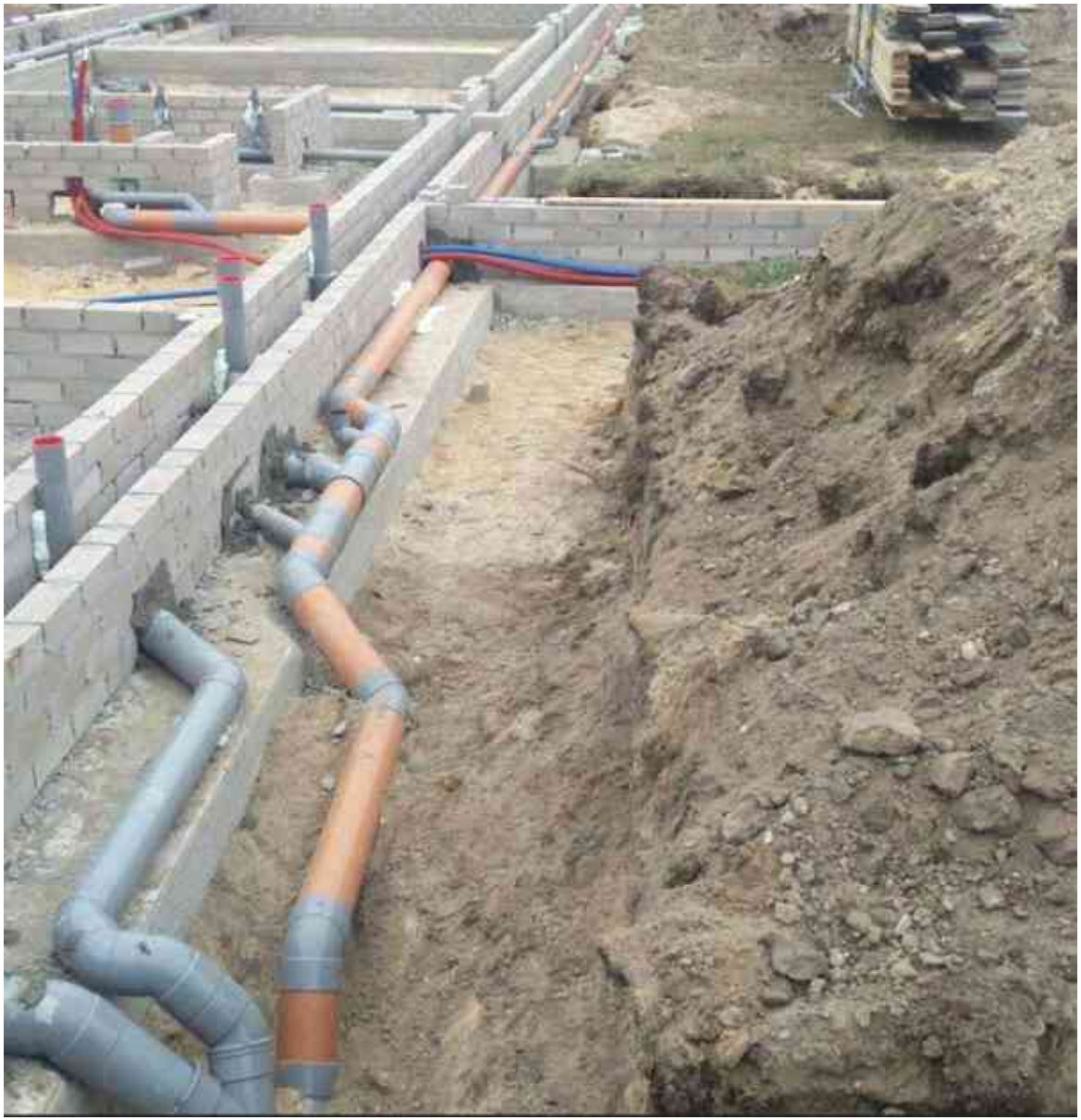
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			The pipe fill level (degree of fill) and gradient must correspond, over-large dimensions or excessive gradients tend to cause blockages	
			Lateral inlets into collecting pipes must be connected with 15° angle from above to protect against backflows and the formation of deposits	 *15° angle inlets*
			Cross-section reductions in flow direction are not allowed	
Working basis				
	Proofs/verifications/ documentation	Pipe pressure of the public supply pipes (non-potable and drinking water pipes), operating, servicing and maintenance instructions of the manufacturers	Check and document the completeness of the documents	
Drinking water (potable water) system Prevention of backflow	SBC 1102 Section 2602 Section 2603 Section 2902	**Protection of potable water.** The potable water system shall be protected from backflow in accordance with the Saudi Plumbing Requirements. Protection objective: Preventing disadvantageous impairment of drinking water hygiene.	Check and document by way of example whether backflow preventers are installed in the drinking water system.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			 *Vent terminology*	
			Pipe dimensioning depending on peak flow, pressure losses due to pipe friction (material, lengths, fittings) and pipe valves and fittings as well as the geodetic height Check installation in non-freezing ground according regional requirements.	 *Check installation in non-freezing ground according regional requirements*

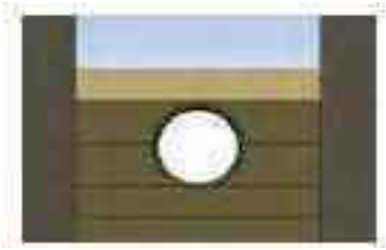
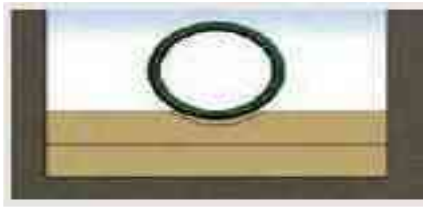
8.18 Mechanical / Electrical / Plumbing: Drainage channel works

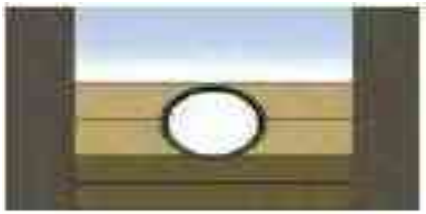
Technical Craft

Drainage and Wastewater outside the building



Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Wastewater (outside of the building)				
Basic principles	SBC 1102 Section 2503 Section 3001 Section 3101 Section 3201	Sanitary Sewer systems Storm drainage systems	Project-related design basis	
Physical principles *(independent of the SBC 1102 standard, only continuous function due – protection objective consideration)*			Gravity drainage All pipes must be continuously free running (flowing) Maximum pipe fill 70%	
			The pipe fill level (degree of fill) and gradient must correspond, over-large dimensions or excessive gradients tend to cause blockages	
Working basis	Construction documents	Floor plans, sections, schematic diagrams, details, groundwater level requirements, flood level	Check and document the completeness of the documents	
	Proofs/verifications	Manufacturers' proofs of suitability, performance of the connection point to the higher-level municipal drainage	Check and document the completeness of the documents	
Pipe material, fittings, connections				
Materials	SBC 1102	*Above-ground sanitary drainage and vent pipe shall conform to one of the standards listed in Table 4.2.1.*	Check and document by way of example that only allowable materials are used, which comply with SBC 701	

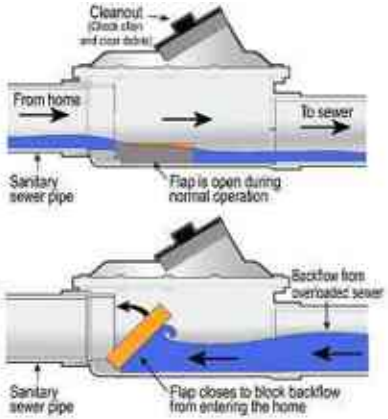
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Underground building sanitary drainage and vent pipe shall conform to one of the standards listed in Table 4.2.2. Protection objective: Use of materials tried and tested through continuous, long-term use only		
Third party certificate and Manufacturer's marking		*Plastic pipe, fittings and components. All plastic pipe, fittings and components shall be third-party certified as conforming to* ***NSF 14****.* *Each length of pipe and each pipe fitting, trap, fixture, material and device utilized in a plumbing system shall bear the identification of the manufacturer.* Protection objective: Use of materials tried and tested through continuous, long-term use only	Check and document by way of example that only marked materials are used, which comply with NSF 14	
Underground (buried) pipes	SBC 1102 Section 2503 Section 3001 Section 3101 Section 3201	*Backfill shall be free from discarded construction material and debris. Loose earth free from rocks, broken concrete and frozen chunks shall be placed in the trench in 150 mm layers and tamped in place until the crown of the pipe is covered by 300 mm of tamped earth. The backfill under and beside the pipe shall be compacted for pipe support. Backfill shall be brought up evenly on both sides of the pipe so that the pipe remains aligned. In instances where the manufacturer's installation instructions for materials are more restrictive than those prescribed by these requirements SBC 701,*	Trench filling and mechanical compaction  Fill above pipe crown, compaction by hand	 Prepared pipe trench base and pipe bedding

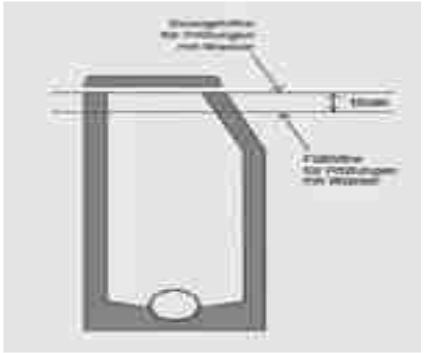
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		the material shall be installed in accordance with the more restrictive requirements. Protection objective: Establishing permanently suitable laying conditions for securing function	 *Check randomly and document whether correct pipe bedding/embedment was made in the ground*	 Lateral fill/embedment to secure the position of the pipe, compaction by hand  *Lateral fill/embedment to secure the position of the pipe, compaction by hand*
Flood protection		*For structures located in flood hazard areas, the following systems and equipment shall be located at or above the design flood elevation: all sanitary drainage piping. Manhole covers shall be sealed, except where elevated to or above the design flood elevation.*	- Check by way of example and document whether there is a risk of flooding in the building/project - If yes, have adequate safeguards been provided?	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection objective: Establishing permanently suitable laying conditions for securing function		
Slope		*Horizontal drainage piping shall be installed in uniform alignment at uniform slopes. The minimum slope of a horizontal drainage pipe shall be in accordance with* ***Table 4.4.1.*** Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether a continuous gradient exists according to the design - Check randomly and document whether the minimum gradient in accordance with Table 4.4.1 has been complied with?	 *Check whether a continuous gradient exists according to the design*
Manhole connections		To avoid pipe fractures, manhole connections must be formed flexibly using several fittings. Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether a flexible manhole connection is present	 *Check whether a flexible manhole connection is present*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Cleaning equipment		*Inspection chambers shall conform to BS EN 124. All covers shall be secured and gas-tight with rubber gasket. Covers shall be installed on the ground and flushed with the finished floor. Covers placed in pedestrian access areas shall be capable to stand 1.5 ton load. Covers placed in car parks, domestic driveways areas with vehicle access shall be capable to stand 12.5 ton load.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check randomly and document whether correct manhole covers have been used	 *Check whether correct manhole covers have been used*  *Check whether correct manhole covers have been used*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Dimensioning, minimum sizes				
Dimensioning	SBC 1102 Section 2503 Section 3001 Section 3101 Section 3201	*The maximum number of drainage fixture units connected to a given size of building sewer, building drain or horizontal branch of the building drain shall be determined using **Table 4.10.1(1)**. The maximum number of drainage fixture units connected to a given size of horizontal branch or vertical soil or waste stack shall be determined using **Table 4.10.1(2)**.* Protection objective: Establishing permanently suitable laying conditions for securing function	- Check and documents whether the requirements in accordance with Table 4.10.1 (1) + (2) have been complied with	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Plumbing fixtures				
Anti-flooding (backwater) protection	SBC 1102 Section 2503 Section 3001 Section 3101 Section 3201	Where the flood level rims of plumbing fixtures are below the elevation of the manhole cover of the next upstream manhole in the public sewer, such fixtures shall be protected by a backwater valve installed in the building drain, branch of the building drain or horizontal branch serving such fixtures. Plumbing fixtures having flood level rims above the elevation of the manhole cover of the next upstream manhole in the public sewer shall not discharge through a backwater valve. Protection objective: Establishing permanently functionally reliable anti-flooding/backwater prevention	- Check and document whether correct anti-flooding/backwater protection devices have been installed	 *Check whether correct anti-flooding/backwater protection devices have been installed*
Manholes		Manholes serving a building drain shall have secured gas-tight covers and shall be located in accordance with Section 4.8.3.2. Protection objective: Establishing permanently suitable laying conditions for securing function	- Check and document whether correct manhole covers have been used	 *Check whether correct manhole covers have been used*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Channels and inlets				
Swimming pool		Where wastewater from swimming pools, backwash from filters and water from pool deck drains discharge to the building drainage system, the discharge shall be through an indirect waste pipe by means of an air gap. Protection objective: Establishing permanently suitable laying conditions for securing function	- Check and document whether the joint has been made correctly	
Inspections, tests				
Leak test	SBC 1102 Section 2503 Section 3001 Section 3101 Section 3201	*All inspection chambers shall be tested for watertightness prior to backfilling, as detailed in BS 8301 (Code of Practice for Building Drainage) and BS 8005 (Guide to new sewer construction).* Protection objective: Establishing permanently leaktight execution	- Check and document whether the required system leaktightness exists	 *Check whether the required system leaktightness exists*
Function test		Simultaneous use of the discharge points Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether all discharge points of an apartment/house simultaneously and noise-free	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Operating safety and reliability		Pipe system kept free from contamination through flushing	- Check and document whether the whole pipe system has been adequately flushed and all deposits from the construction period have been removed - Check and document whether all manholes including the manhole covers have been cleaned - Check and document whether all manhole covers are positioned safely and completely and can be removed	
Documentation				
Operating instructions		For channels, gullies and manhole covers Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether appropriate operating instructions, suitably worded for ordinary persons, are available	
As-built plan		As-built-drawing with dimensions Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether the complete documents of the as-built situation are available in full	
Servicing, care and maintenance instructions		Notes on preventive flushing Protection objective: Establishing permanently safe to use and reliable function	- Check and document whether appropriate notes, suitably worded for ordinary persons, are available	

Mechanical / Electrical / Plumbing: Fire protection

Technical Craft

Fire safety

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
Fire safety - Safety - Extinguishing measures - Value retention	**Fire protection – classification of the building**			
	SBC 1101 Section 303 SBC 201 Section 310 Section 705	Building classification Building use (occupancy)	Residential building with continuous use R-2 with more than 2 dwelling units R-3 up to 2 dwelling units	 *Residential building; 2 dwelling units*
		Building use (occupancy)	Solely as residential use No increased hazard potential from use and fitout	 *Residential building; 2 dwelling units*
		Basement stories	Note and comply with definition and story classification according to SBC 801 Section 3.3	

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
		Intermediate or half-story (mezzanines)	Note and comply with definition and story classification according to SBC 801 Section 3.5	
		Building height / type of construction	Detached houses (R-3) – usually with 3 stories above ground ⇨ construction type VA or VB . Multiple occupancy buildings (R-2) – depending on number of stories, construction type .	
		Fire compartments	Detached houses (R-3) - usually with 3 stories above ground ⇨ no area limitation Multiple occupancy buildings (R-2) – depending on number of stories, area limitation	

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
		Detached houses (R-3) Construction type V		

TABLE 4A.1
FIRE RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
	A	B	A	B	A	B	HT	A[d]	B
Structural frame[a] Includingcolumn,griders,trusses	3[b]	2[b]	1	0	1	0	HT	1	0
Bearing Walls Exterior[f] Interior	3 3[b]	2 2[b]	1 1	0 0	2 1	2 0	2 1/HT	1 1	0 0
Non bearing Walls and Partitions Exterior	See Table 4A.2								
Non bearing Walls and Partitions Interior[e]	0	0	0	0	0	0	See Section 4A.2.4.6	0	0
Floor Construction Including supporting beams and joists	2	2	1	0	1	0	HT	1	0
Roof Construction Including supporting beams and Joists	1 1/2[c]	1[c]	1[c]	0	1[c]	0	HT	1[c]	0

The fire-resistance ratings of the individual building elements according to the construction type must fulfil the requirements in SBC 801 Table 4A.1.

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
		Construction materials	No requirements are set for the construction materials / construction material class with regard to flammability for construction type V, provided the fire-resistance rating requirements can be verified.	
	Fire protection – building element requirements			
	SBC 1101 Section 303 SBC 201 Section 705	Building separating walls (party walls)	The fire-resistance rating of the building separating (party) wall, taking into consideration existing distances from adjacent buildings and according to the type of construction, must comply with the requirements in SBC 801 Table 4A.2.	 *Fire separation distance*

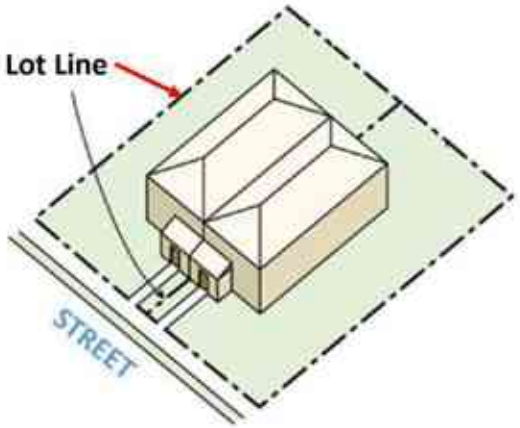
Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
		Exterior walls	Exterior walls must comply with the requirements according to SBC 801 Section 4B.4 (exterior walls).	 *Exterior walls*
		Fire walls	Fire walls must comply with the requirements according to SBC 801 Section 4B.4 (exterior walls).	
		Fire resistant separated areas (fire barriers)	Areas in which fire protection separation becomes necessary or is to be achieved, must comply with the requirements to SBC 801 Section 4B.6 (fire barriers).	
		Floors / ceilings	Floors and ceilings must comply with the requirements according to SBC 801 Section 4B.11 (horizontal assemblies).	
		Load-bearing members	Load-bearing members must comply with the requirements according to SBC 801 Section 4B.14 (structural members).	
		Installation shafts	Installation shafts with fire-resistance requirements must comply with the requirements to SBC 801 Section 4B.7 (shaft enclosures).	
		Fire-resistant building elements	Fire resistance must be demonstrated by testing to ASTM E 119.	

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
	Fire protection – construction materials and type requirements			
	SBC 1101 Section 303 Section 319 SBC 201 Section 1001	Openings / closure of openings	Openings and the closure of openings must comply with the requirements according to SBC 801 Section 4B.12 (penetrations).	
		Cladding	The fire protection requirements for plasters are to be taken into consideration according to SBC 801 Section 4B.18 (plaster).	
		Penetration seals (joint systems)	Penetration seals (joint systems) must comply with the requirements in SBC 801 Section 4B.13 (joint systems). Joint systems must be tested to ASTM E 1966 or UL 2079.	
		Fire doors / fire-resistant windows / opening protectives Fire protection ratings – please refer to the respective Saudi Building Code sections.	Fire doors must comply with the requirements in SBC 801 Section 4B.15 (opening protectives). Fire-resistant windows (glazing) must be executed in accordance with the requirements in SBC 801 Section 4B.15. Fire-resistant opening protectives must be executed in accordance with the requirements in SBC 801 Section 4B.15.	
		Thermal insulation materials / sound insulation materials	Fire protection requirements for insulation materials are to be taken into consideration according to SBC 801 Section 4B.19 (thermal and sound-insulating materials).	
		Fire-resistant construction methods / types	Fire-resistant building elements made of masonry, concrete, steel can be built according to SBC 801 Sec. 4B.21 (calculated fire resistance) in conjunction with SBC 801 Section 4B.20 (prescriptive fire resistance).	

Craft	Basis/Standards	Technical function	Inspection scope	Defects, finding and notes
	Fire protection – general requirements / fire safety concept			
	SBC 1101 Section 303 Section 319 SBC 201 Section 1001	Escape routes	Escape routes are to be designed and built according to SBC 801 Chapter 8 (means of egress).	
		Organisational fire safety measures	Organisational fire safety measures are to be defined according to SBC 801 Chapter 5 (General precautions against fire, emergency planning and preparedness, fire service features, building services and systems).	
		Defensive fire protection measures / areas for the fire service	The areas for the fire service are to be designed in accordance with SBC 801 Appendix D (Fire apparatus access roads).	
		Defensive fire prevention measures / fire-fighting water supply	The fire-fighting water supply is to be designed in accordance with SBC 801 Appendix B (Fire-flow requirements for buildings) and Appendix C (fire hydrant locations and distribution).	
		Identification (marking) according to SBC 801 Section 3.1.2	After they have been built, residential areas / residential buildings must be adequately identified. The identification must be easily visible and legible from the (public) road. Requirements regarding the lettering size, font and colour must be complied with.	 *Residential buildings identification*

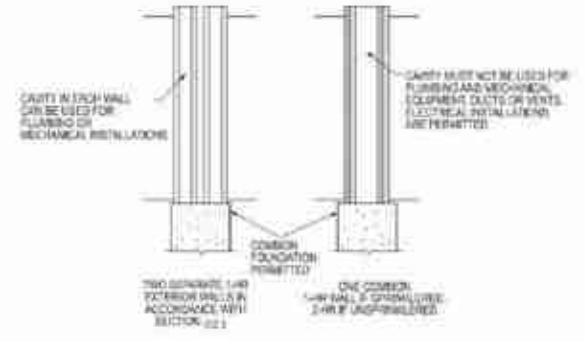
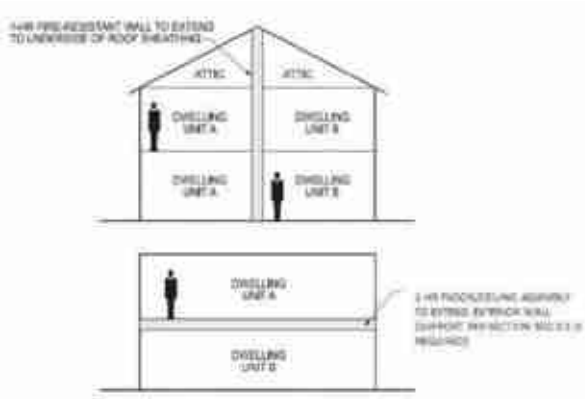
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
General	Most of the fires in the United States of America **occur in residential buildings**, particularly one- and two-family dwellings. These fires account for more than **80 percent of all deaths** from fire in residential uses (including hotels, apartments, dormitories, etc.) and about two-thirds of all fire fatalities in any type of building. One- and two-family dwellings also account for more than **80 percent** of residential **property losses** and more than one-half of all property losses from fire. Each townhouse must be: • **structurally independent** and • capable of being **removed** without affecting the adjacent dwelling unit. This provision is applicable only to **townhouses, not two-family dwellings**. This independence is useful not only in the event of a fire in one unit, but also during any remodeling or alteration. The objective of the is structural independence is that a **complete burnout** could occur on one side of the wall without causing the **collapse of the adjacent townhouse.** This condition occurs rarely. The provision also helps if there is ever **a fire** or other problem by creating a **clear separation between the units.** With separate ownership and each owner having a different **insurance company**, the ability to gain		

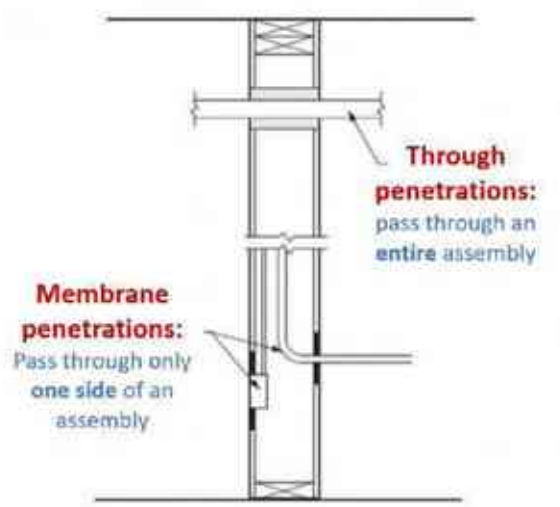
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	access or get repairs made can be difficult and time consuming. By having clearly separated units, it is much easier to determine **who is responsible and to make any needed repairs**		
Fire-resistant constructions SBC-1101 Section-302	This section groups the fire-resistant construction requirements for building elements that are located between and within dwelling units and within close proximity of lot lines. This section addresses: 1. Exterior wall location. 2. Townhouse separation. 3. Two-family dwellings separation. 4. Rated penetrations. 5. Garage penetrations. 6. Garage separation. 7. Under-stair protection. 8. Flame spread and smoke development. 9. Insulation. 10. Fire-blocking. 11. Draft stopping required. 12. Insulation clearance from heat-producing devices.	**Inspect**: • exterior walls separation distance from **lot line**. • percentage of openings in exterior walls. • Are openings "protected" (fire-rated doors, windows, shutters) or "unprotected" (no fire rating)? • townhouse fire-wall separation. • Fire-resistance martials: is it tested in accordance with ASTM E119 or UL 263?	Openings in exterior walls typically consist of: 1. windows and 2. doors. An exterior wall may or may not be allowed to have openings depending on the fire separation distance.  Openings in exterior walls

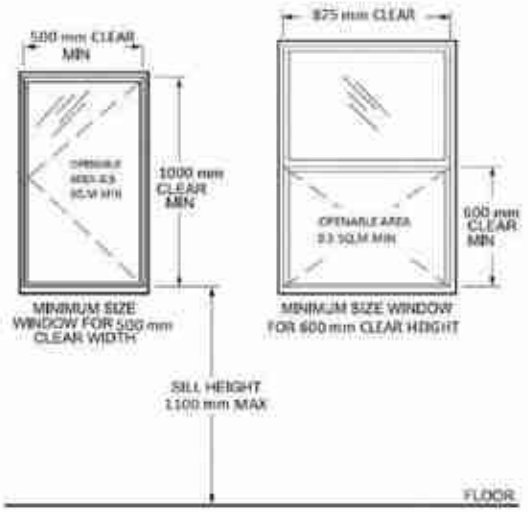
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			
	Exterior walls		
	Exterior walls of: 1. dwellings and 2. accessory buildings shall comply with: • **Table 3-12**: dwellings **without** automatic sprinkler system. • **Table 3-13**: dwellings equipped **throughout** with automatic sprinkler system.	• Are dwellings equipped throughout with automatic sprinkler system? • Is the automatic sprinkler system installed in accordance with Section 2904 of SBC 1102? • Inspect the followings in the exterior walls: ○ Construction materials, ○ Projections, ○ Openings (area percentage), ○ Penetrations. • Measure the fire separation distance: ○ if it is more than 1500 mm, then no fire-resistance ratings are required and the openings in the external walls are unlimited in area.	**EXTERIOR WALL** is - an above-grade wall that defines the exterior boundaries of a building. - and basement walls with an average below-grade wall area that is less than 50 percent of the total opaque and nonopaque area of that enclosing side.  (Copy SBC 1101, page 177)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
		○ if it is equals 900 mm, the gross area of openings in the external walls shall be less than 25% of wall area.	 (Copy SBC 1101, page 177) In dwellings **without** fire sprinkler & the fire separation distance is **less than** 900 mm: a. Walls fire resistance ratings shall be at least 1-hour (exposure from the outside). b. openings in exterior walls are **not allowed**. c. penetrations in exterior walls shall comply with section 302.4 of SBC 1101.
	Common wall of Townhouses		
	Common walls separating townhouses shall be assigned a fire-resistance rating: 1. Where a fire sprinkler system is **provided**, the common wall shall be not less than a **1-hour fire**-resistance-rated wall assembly. 2. Where a fire sprinkler system is **not** provided, the common wall shall be not less than a **2-hour** fire-resistance-rated wall assembly. 3. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing.	• Are dwellings equipped throughout with automatic sprinkler system? • Is the automatic sprinkler system installed in accordance with Section 2904 of SBC 1102? • Are fire-resistance martials tested in accordance with ASTM E119 or UL 263 • Is the wall separating the townhouses of: ○ Two separate 1-hour exterior walls in accordance with section 302.1? ○ One common 2-hour wall (unsprinklered) or 1-hour wall (sprinklered)?	**A common wall** is a fire-resistance rated wall that extends continuously from the foundation to the underside of fire protected roof sheathing or through the roof to a parapet.

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	The common wall **shared** by two townhouses shall be constructed **without**: • Plumbing or mechanical equipment, • ducts or vents. in the cavity of the common wall. But electrical installations in the cavity of the common wall is allowed if: • it in accordance with Chapters 34 through 43 of SBC 1102. • Penetrations of the membrane of common walls for **electrical outlet boxes** shall be in accordance with Section 302.4. If the common wall is constructed from **two separate** 1-hour exterior walls, then it is allowed to install plumbing, mechanical equipment, ducts and vents in the cavity of each wall.	• Are plumbing or mechanical equipment, ducts or vents installed in the wall separating townhouses which is constructed from **two separate** 1-hour exterior walls? **(Permitted installation)** • Are plumbing or mechanical equipment, ducts or vents installed in in **the cavity** of the **common wall**? **(Prohibited installation)** • Are electrical installations **in the cavity of the common wall** installed in accordance with Chapters 34 through 43 of SBC 1102?	 Common wall In general, because the "exterior wall" of the townhouse is essentially being constructed with **no fire separation distance** where one townhouse adjoins another, the code requires ,that the wall have not less than a 1-hour fire -resistance rating. The adjacent townhouse would have the same requirement. Therefore**, each townhouse has its own fire-resistance rated "exterior wall"**, This would result in the construction of two separate 1-hour walls located side by side where one townhouse adjoins another.

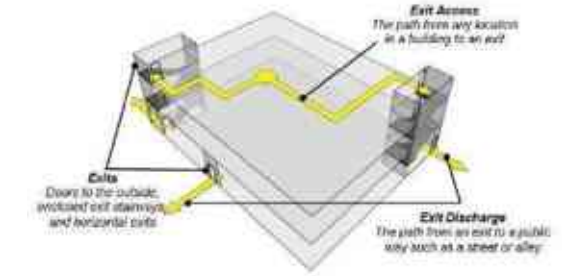
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 (Copy SBC 1101, page 195)
	Two-family dwellings separations		
	• Dwelling units in two-family dwellings shall be separated from each other by wall and floor assemblies having **not less than** a **1-hour fire-resistance rating** where tested in accordance with ASTM EI 19 or UL263. • Fire -resistance-rated floor ceiling and wall assemblies shall **extend** to and be **tight** against the exterior wall, and wall assemblies shall extend from the foundation to the underside of the roof sheathing. • A fire-resistance rating of a **half-hour** shall be permitted in buildings equipped **throughout** with an **automatic sprinkler system** installed in accordance with **NFPA 13**.	• Are the two-family dwellings equipped throughout with automatic sprinkler system? • Is the automatic sprinkler system installed in accordance with **NFPA13**? • Are fire-resistance martials tested in accordance with ASTM E119 or UL 263? • Are the separation wall and floor assemblies having **not less than** a **1-hour fire-resistance** rating? • Are Fire -resistance-rated floor, ceiling and wall assemblies shall **extend** to and be **tight** against the exterior wall?	 (Copy SBC 1101, page 197)

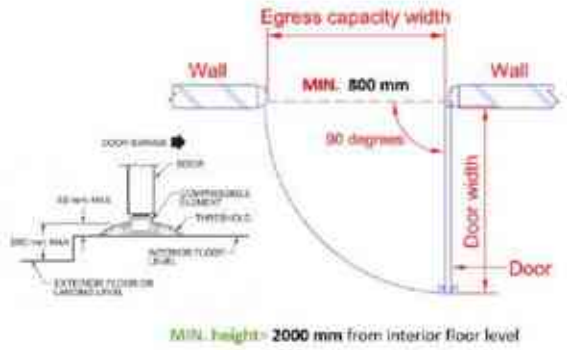
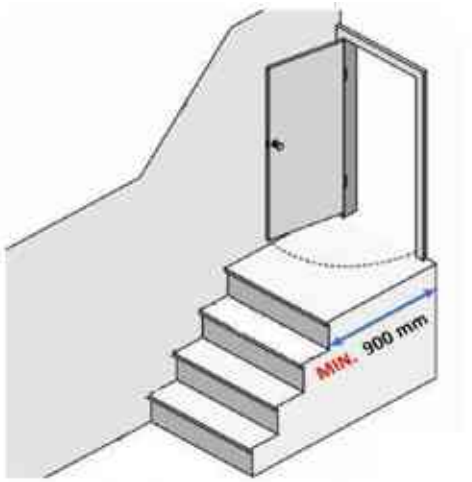
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Penetrations in fire-resistance rated assemblies		
	Dwelling unit **rated penetrations** in: 1. Exterior walls with the fire separation distance less than 900 mm. 2. Common wall of Townhouses. 3. Two-family dwellings separations shall be protected in accordance with the followings: • shall be protected by an approved **penetration firestop system** installed as tested in accordance with ASTM E814 or UL 1479. • shall have an F (Flame) rating of not less than the required fire-resistance rating of the wall or floor-ceiling assembly penetrated. The above requirements cover the two types of wall or floor-ceiling assemblies' penetrations: 1. Through penetrations. 2. Membrane penetrations.	• Are penetrations in fire-resistance rated assemblies protected by an approved penetration **firestop system** installed as tested in accordance with ASTM E814 or UL 1479? • Is the **F** (Flame) rating of penetrations in fire-resistance rated assemblies **less than** the required fire-resistance rating of the wall or floor-ceiling assembly penetrated?	○ **Rated penetrations** are penetrations in fire-resistance rated wall or floor-ceiling assemblies. ○ **Through penetrations** are penetrations that pass through an entire assembly. ○ **Membrane penetrations** are penetrations through only one side of an assembly.  (Copy SBC 1101, page 198) Through-penetration **firestop systems** consist of specific materials or an assembly of materials that are designed to restrict the passage of: ○ fire and ○ hot gases ○ for a prescribed period of time through openings made in fire-resistance-rated assemblies.

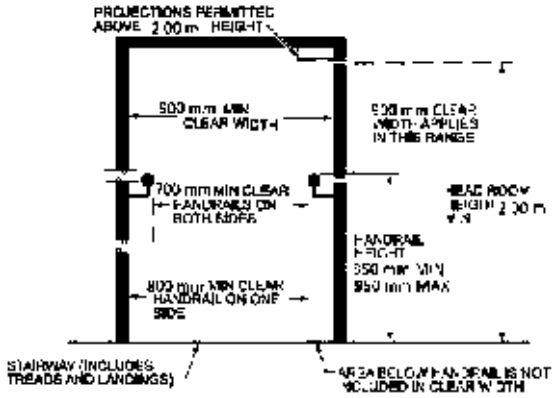
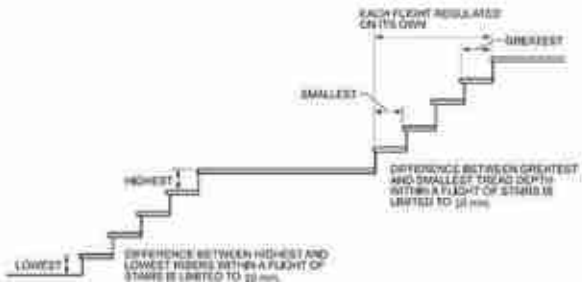
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Flame spread index and smoke-developed index for wall and ceiling finishes		
	Flame spread index and smoke-developed index for wall and ceiling finishes shall be in accordance with the followings: • Wall and ceiling finishes shall have a **flame spread index** of **not** greater than **200**. • Wall and ceiling finishes shall have a **smoke-developed index** of **not** greater than **450**. Testing of interior finishes shall be made in accordance with: ▪ ASTM E84 or UL 723 or ▪ NFPA 286.	○ Check the wall and ceiling finishes **flame spread index.** ○ Check the wall and ceiling finishes **smoke-developed index**. ○ Are the wall and ceiling finishes tested accordance with ASTM E84 or UL 723?	▪ The control of interior finishes is an important aspect of fire protection and this can be done by controlling fire growth within buildings by restricting interior finish materials. ▪ The rapid spread of fire presents a threat to the occupants of a building by limiting or denying their use of exit ways within and outside the building. This can be caused by the rapid spread of the fire itself or by the production of large quantities of dense, black smoke, which obscures the exit path or makes movement difficult.
EMERGENCY ESCAPE AND RESCUE OPENINGS **SBC-1101 SECTION 310**	At least one **operable** emergency escape and rescue opening shall be installed in: ○ **Every sleeping room**, ○ Basements and, ○ Habitable attics. Where basements contain one or more **sleeping rooms**, an emergency escape and rescue opening shall be required in **each sleeping room**. Emergency escape and rescue openings shall open **directly** into: ○ a public way, or ○ to a yard or court that opens to a public way.	Inspect all **sleeping rooms** for emergency escape and rescue opening: ○ Is it **operable**? ○ Is it **openable**? ○ Is the **height** of the opening greater than 600 mm? (width=875 mm) ○ Is the **width** of the opening greater than 500 mm? (height = 1000 mm) ○ Is the **area** of the opening greater than 0.53 m^2? ○ Is the height of the **windowsill** less than or equal to 1100 mm? ○ Is it open **directly** into: a public way, or to a yard or court that opens to a public? ○ Is the horizontal area of the **window well** less than 0.9 m^2? ○ Is the horizontal projection and width of the **window well** less than 900 mm?	 (Copy SBC 1101, page 213) Emergency and escape rescue openings shall have: ○ net clear opening of not less than 0.53 m^2. ○ net clear height of not less than 600 mm.

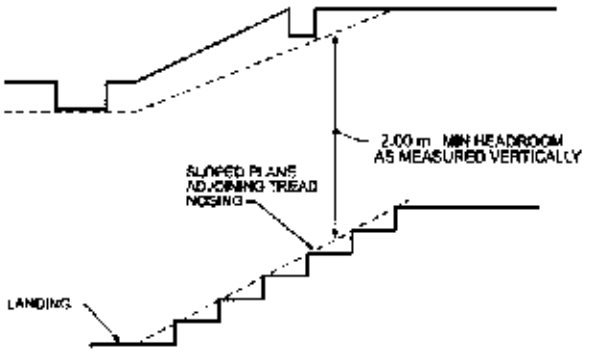
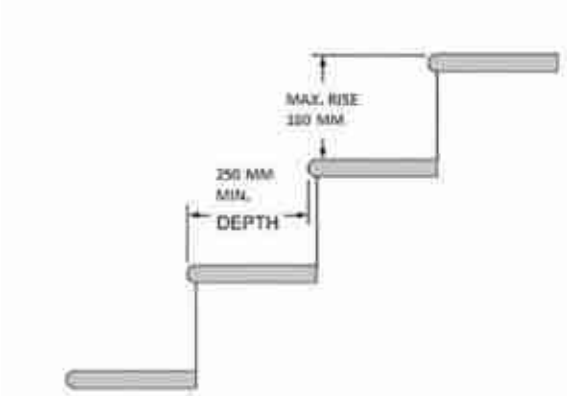
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Bars, grilles, covers, screens or similar devices are permitted to be placed over emergency escape and rescue openings provided that: ○ The minimum net clear opening size (0.53 m^2,600 mm,500mm), and ○ Such devices shall be releasable or removable from the inside without the use of a key, tool, special knowledge or force greater than that required for the normal operation of the escape and rescue opening.	○ Are window security devices (Bars, grilles, covers, screens): ▪ releasable or removable from the inside, ▪ without the use of a key, tool, special knowledge or ▪ force greater than that required for the normal operation of the escape and rescue opening?	○ net clear width of not less than 500 mm. ○ windowsill height of not more than 1100 mm above the floor.  The horizontal area of the window well shall be not less than 0.9 m^2, with a horizontal projection and width of not less than 900 mm. The area of the window well shall allow the emergency escape and rescue opening to be fully opened.  (Copy SBC 1101, page 213)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			

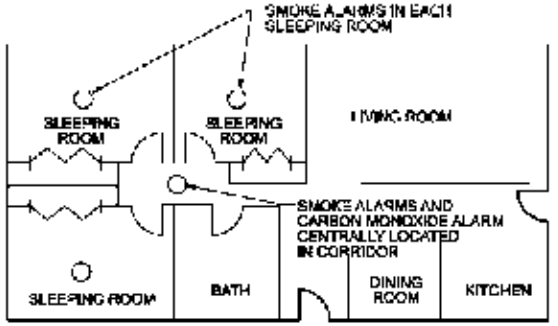
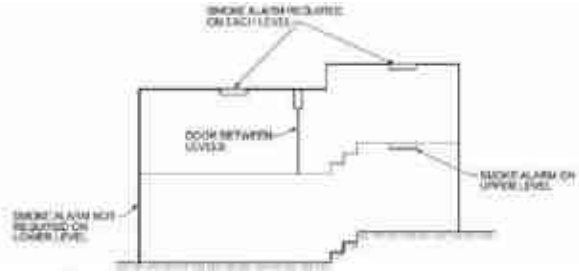
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
MEANS OF EGRESS **SBC-1101 SECTION 311**	**Means of egress**		
	Dwellings shall be provided with a **means of egress**. The **means of egress** shall provide a: ▪ continuous and ▪ unobstructed path of ▪ vertical and horizontal egress travel from all portions of the dwelling to the required **egress door** ▪ without requiring travel through a garage. ▪ The required egress door shall open directly into a: ○ public way or ○ to a yard or court that opens to a public way.	Is the **mean of egress**: • exist? • Vertical and horizontal egress travel from all portions of the dwelling to the required **egress door** • Continuous path? • Unobstructed path? • Without requiring travel through a garage? • Opens directly into a: ○ public way or ○ to a yard or court that opens to a public way.	  *Mean of egress*
	Egress door		
	Not less than **one egress door** shall be provided for **each dwelling unit**. The **egress door** shall be: • side-hinged, and • shall provide a clear width of not less than **800 mm**, • with the door open **90 degrees**.	Inspect the following: • At least one egress door exists for each dwelling unit. • clear width of egress door not less than 800 mm. • clear height of egress door not less than 1950 mm. • Egress door opens 90 degrees.	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• The clear height of the door opening shall be **not less than 2000 mm** from interior floor level (1950 mm from level measured from the **top of threshold-** 50 mm of threshold). • shall be readily openable from inside the dwelling. • without the use of a key or special knowledge or effort. There shall be a landing or floor on each side of each exterior door. The width of each landing shall be not less than the door served or not less than 900 mm measured in the direction of travel. The slope at exterior landings shall not exceed 2%.	• Egress door opens from inside the dwelling without the use of a key or special knowledge or effort. • Egress door is side-hinged. • A landing or floor on each side of egress door exist. • The width of egress door landing is not less than the door served measured in the direction of travel or Min. 900 mm. • The slope of egress door landing is 2% Max.	 (Copy SBC 1101, page 214- Modifed)  **landing at exterior doors:** **shall be not less than the door served or not less than 900 mm measured in the direction of travel.**

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Stairways, landings, and hallways		
	1. The width of a **hallway** shall be not less than **900 mm.** 2. **Stairways** shall be: • not less than **900 mm** in **clear width** • The **headroom** in stairways shall be not less than **2000 mm.** • The riser height shall be not more than 180 mm. • The greatest riser height within any flight of stair shall not exceed the smallest by more than 10 mm. • The tread depth shall be not less than 250 mm. • The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 10 mm. **Landings for stairways:** • There shall be a floor or landing at the top and bottom of each stairway. • The width perpendicular to the direction of travel shall be not less than the width of the flight served. **Handrail height:** Shall be not than 850 mm and not more than 950 mm. **Illumination:** Stairways shall be provided with illumination in accordance with the following: • Interior stairways shall be provided with an **artificial light** source to illuminate the landings and treads.	Inspect the following: • The width of the **hallway**, **Landings for stairways** and **stairway** is **900 mm Min.** • The **headroom** in stairways is **2000 mm Min.** • The stairway riser is 180 mm **Max**. • The stairway tread depth is 250 mm **Min**. • All risers and treads have the same height and depth, Max. allowed difference is 10 mm per stair flight. • floors or landings at the top and bottom of each stairway exist. • **Handrail height** is between 850 mm and 950 mm. • Stairways are provided with **artificial light** source to illuminate the landings and treads to levels of **11 lux. Min.** • Wall **switches at each floor** level to control the light source exist.	 (Copy SBC 1101, page 214)  (Copy SBC 1101, page 216)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	• The light source shall be capable of illuminating treads and landings to levels of **not less than 11 lux** measured at the center of treads and landing. • There shall be a wall **switch at each floor** level to control the light source where the **stairway has six or more risers**.		 (Copy SBC 1101, page 215)  (Copy SBC 1101, page 216)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Automatic FIRE SPRINKLER SYSTEMS **SBC-1101 SECTION 313**	It is **not mandatory** to install automatic residential fire sprinkler system in: • One and two-family dwellings, and • Townhouses. An automatic residential fire sprinkler system **is permitted to be installed** in one and two-family dwellings and townhouses. **Required sprinkler locations (if available):** Sprinklers shall be installed to protect **all areas a dwelling unit.** **Exceptions:** 1) Attics, crawl spaces and normally unoccupied concealed spaces that **do not contain fuel-fired appliances** do not require sprinklers. 2) In attics, crawl spaces and normally unoccupied concealed spaces be installed **above the equipment**; however, sprinklers shall not be required in the remainder of the space 3) Clothes closets, linen closets and pantries not exceeding 2.2 m^2 in area, with the smallest dimension not greater 900 mm and having wall and ceiling surfaces of gypsum board. 4) Bathrooms **not more than 5.1 m^2** in area. 5) Garages; carports; exterior porches; unheated entry areas, such as mud rooms, that are adjacent to an exterior door; and similar areas.	If the automatic sprinkler system is installed, check the following: • **For townhouses**: is the automatic sprinkler system installed in accordance with Section 2904 of SBC 1102? • **For two-family dwellings**: is the automatic sprinkler system installed in accordance with **NFPA13**?	

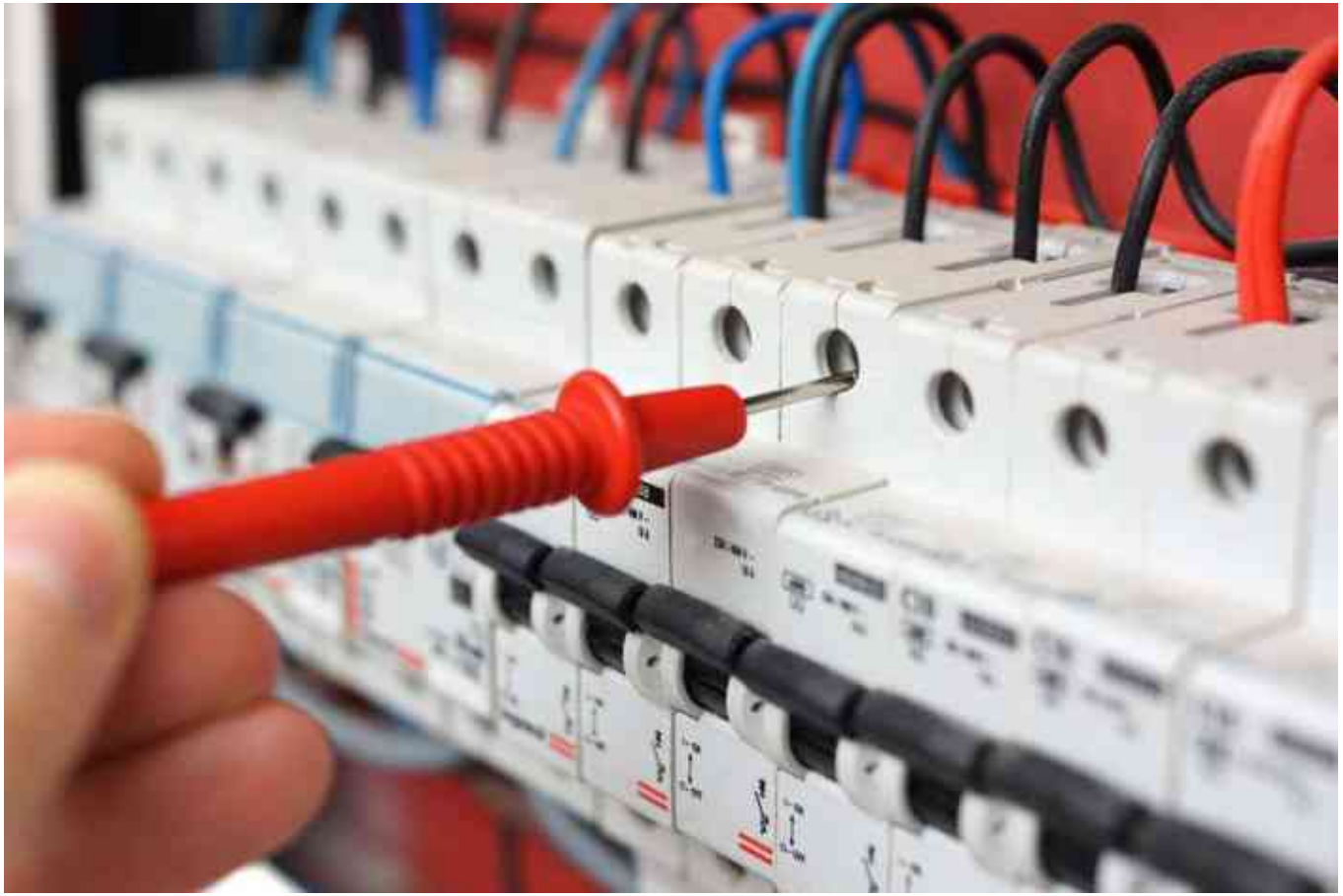
Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
Smoke alarms and carbon monoxide alarms **SBC-1101 SECTION 314 SECTION 315**	• Smoke alarms shall comply with NFPA 72. • Smoke alarms shall be listed in accordance with UL 217. • Smoke alarms and carbon monoxide detectors shall be permitted to be installed in fire alarm system in lieu of smoke detectors, provided that they are listed in accordance with UL 268 and UL 2075. **Location:** Smoke alarms shall be installed in the following locations: 1. In each sleeping room. 2. Outside each separate sleeping area in the immediate vicinity of the bedrooms. 3. On each story of the dwelling, including basements and habitable. 4. Smoke alarms shall be installed not less than 900 mm horizontally from the door or opening of a bathroom that contains a bathtub or shower unless this would prevent placement of a smoke alarm require by the above locations. **Interconnection**: • Smoke detectors within a dwelling are required to be interconnected so that activation of any of the smoke detectors on any level will activate all of the alarms in the individual dwelling and ensure that occupants are alarmed. • Listed wireless interconnected alarms could substitute for wired interconnection of the smoke alarms in both new and existing construction.	• Are smoke alarms and carbon monoxide detectors listed in accordance with UL 268 and UL 2075? • Are smoke alarms installed in all sleeping rooms? • Are smoke alarms and carbon monoxide detectors installed in corridors of sleeping rooms? • Are smoke alarms installed in every story of the dwelling, including basements and habitable? • Are smoke alarms within a dwelling are interconnected? • Are smoke alarms installed a Min. of 900 mm horizontally from the door or opening of a bathroom that contains a bathtub or shower?	 (Copy SBC 1101, page 225)  (Copy SBC 1101, page 224)

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
			 *Smoke detectors within a dwelling are required to be interconnected*

8.19 Mechanical / Electrical / Plumbing: Electrical installations, earthing and equopotential bonding

Technical Craft

Electrical Installations

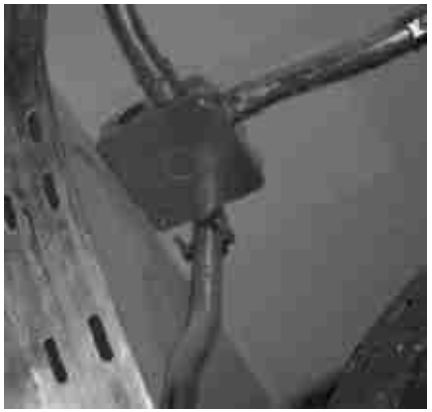
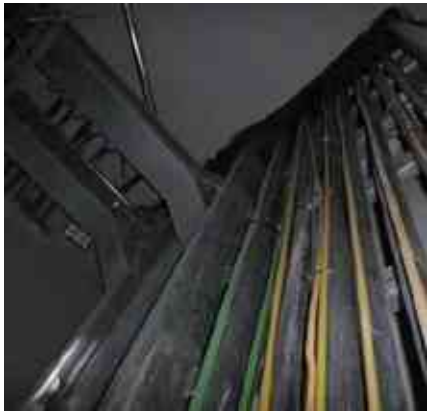


Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Electrical installations	- Earthing - Equipotential bonding - Lightning protection, overvoltage protection - Mains configurations, protective measures - Distribution - Laying systems (conduits, cable ducts, etc.) - Cables, wires, conductors - Lighting (basic lighting, safety lighting) - Installations (sockets, switches, bathrooms, etc.) - Fire alarm system - Alarm systems - Communication and data technology - Emergency power system (**optional**) - Tests - Documentation			
Basic principles				
Legal foundations	SBC 1102 Section 3402			
Technical foundations		Electrical		
		Fire protection requirements, insofar as applicable to the electrical systems		
Working basis				
Planning documents		Floor plans, installation diagrams, distribution diagrams, fire protection	- Check and document the completeness of the documentation - Observe separation of the systems (data/ communication technology with 220/380 V / 60 Hz) - Check mains configurations and protective measures - (e.g. TN-S mains network, circuit breakers) - Check reserved space and power reserves	

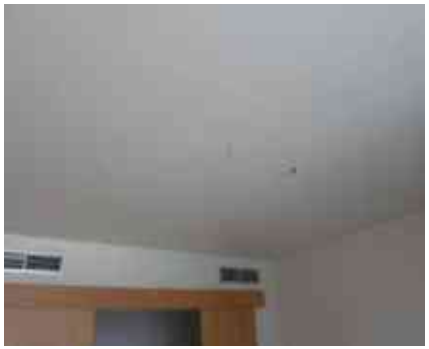
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Descriptions		Functional descriptions, material definitions (cables, wires, conductors, etc.), diagrams, manufacturer information	- Check and document the completeness of the documentation - Check implementation options	
Calculations		Max. permissible voltage drop, shut-down conditions, short-circuit currents, minimum illuminance values	- Check and document the completeness of the documentation	
Verification		Suitability verification from the manufacturer, supply verifications (electrical supply company, telecommunications company)	- Check and document the completeness of the documentation	
Earthing, lightning and overvoltage protection, equipotential bonding				
Earthing: Materials, cross sections	SBC 1102 Section 3602	Important constituent part of the electrical installation for proper protective measures (e.g. foundation earthing electrode in the floor slab) Protective goal: - Use of approved, tested materials with the required cross section	Use examples to check and document that only approved materials have been used	 *Foundation earthing electrode*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Lightning and overvoltage protection		Check the extent to which an external lightning protection system is required and harmonisation with the other overvoltage protection facilities Protective goal: Use of approved, appropriately dimensioned/tailored materials/products	Check and document	 *Lightning protection system*
Mains configurations, protective measures, equipotential bonding				
Mains configurations, protective measures	SBC 1102 Section 3703	Verify the protective measures (protection of systems and people) and their implementation by means of the selected mains configuration Protective goal: Creation of permanently effective protection of systems and people	Check using spot-checks and document	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Equipotential bonding		Minimise/prevent the hazard of electric shock by properly implemented equipotential bonding system (connection of metal conduits, laying systems, etc.) Adequate number of connection facilities (equipotential bonding rail) and adequately dimensioned materials required. Protective goal: Overload/short-circuit protection and protection of people (protection against electric shock) permanently assured	Check using spot-checks and document	 *Panel board of earthing*
Laying systems (conduits, cable ducts, etc.), fire protection				
Conduit (metal and plastic tubing)	SBC 1102 Section 3801	Proper laying of wires with basic insulation and also double-insulated cables (e.g. NYM cable) Protective goal: Creation of permanent, suitable installation conditions for permanent function but also protection of people	Check using spot-checks and document whether the minimum fastening requirements have been complied with	 *Main switches box*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Cable ducts		Proper laying of metal cable ducts, metal cable ladders, etc. for fastening double-insulated cables and wires Protective goal: Creation of permanent, suitable installation conditions for function but also protection of people	Use examples to check and document whether the minimum requirements have been complied with	 ***Cable ducts installation***
Fire protection	SBC 1101 Section 302	*Annular spaces between sleeves and pipes shall be filled or tightly caulked in an approved manner. Annular spaces between sleeves and pipes in fire resistance rated assemblies shall be filled or tightly caulked in accordance with the Saudi Building Code Fire Protection Requirements SBC 801.* *Penetrations of floor/ceiling assemblies and assemblies required to have a fire resistance rating shall be protected in accordance with the Saudi Building Code Architectural* Protective goal: Creation of permanent, suitable installation conditions, also with regard to preventative fire protection	Check and document whether all required fire-related wall and/or ceiling electrical pass-throughs (conduits, cable ducts, etc.) have been sealed.	 ***Fire wall construction***

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Cables, wires, conductors – minimum cross sections, etc.				
Cable	SBC 1102 Section 3802	Selection of approved and adequately dimensioned Cable Protective goal: Creation of permanent, suitable cable terminations and connections	- Check and document whether the selected cabling is suitable and adequately dimensioned for the purpose	
Wiring	SBC 1102 Section 3802	Selection of approved and adequately dimensioned Wiring Protective goal: Creation of permanent, suitable wire terminations and connections	- Check and document whether the selected wiring is suitable and adequately dimensioned for the purpose	
Conductors		Selection of approved and adequately dimensioned conductors Protective goal: Creation of permanent, suitable conductor terminations and connections	- Check and document whether the selected conductors / conductor connections are suitable and adequately dimensioned for the purpose	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Distribution				
Layout, dimensioning	SBC 1102 Section 3802	Distributor selection with regard to surface-mounting / flush-mounting in conjunction with the required protection class (IP XX) and adequate equipment/space reserves (circuit breakers, IT supplies, etc.) Protective goal: Assure permanent and future-proof electrical supply in compliance with the separation of IT / 220 V 60 Hz supplies in the distribution	- Check and document whether the requirements are fulfilled	 *Assure permanent and future-proof electrical supply in compliance with the separation of IT / 220 V 60 Hz supplies in the distribution*
Lighting				
Basic lighting	SBC 1102 Section 4001	Assure adequate number of lighting outlets and thus minimum illuminance values Protective goal: Creation of adequate and appropriate lighting	- Check and document whether adequate lighting will be established	 *Adequate lighting is established?*

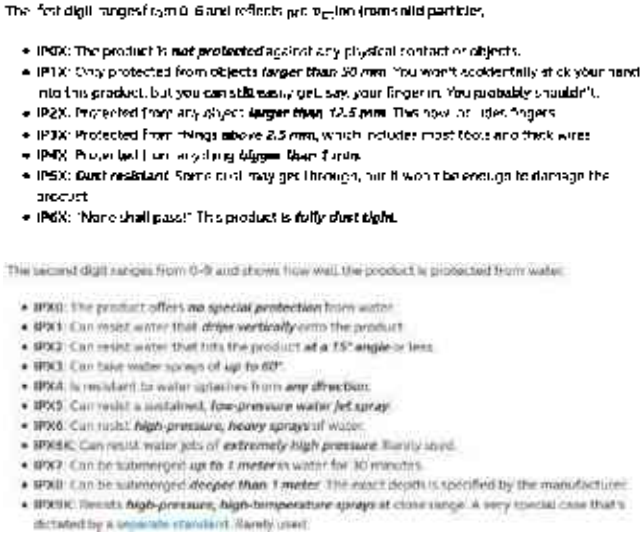
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Safety lighting	SBC 1102 Section 4004	Assure requirements and, if necessary, minimum equipment / changeover to battery operation Protective goal: Assure minimum illuminance value via battery lighting in the event of a mains power failure	- Check and document whether the safety lighting switches to battery operation quickly enough and that a minimum illuminance value is achieved	 *Safety lighting*
Installations (sockets, switches, bathrooms, etc.)				
Sockets, switches	SBC 1102 Section 3901	Install in adequate numbers and in proper condition with regard to safety (protected from being touched, etc.) Protective goal: Creation of permanent, suitable electrical equipment installations and permanently safe functionality	- Check using spot-checks and document, the proper function and proper implementation with regard to safety	

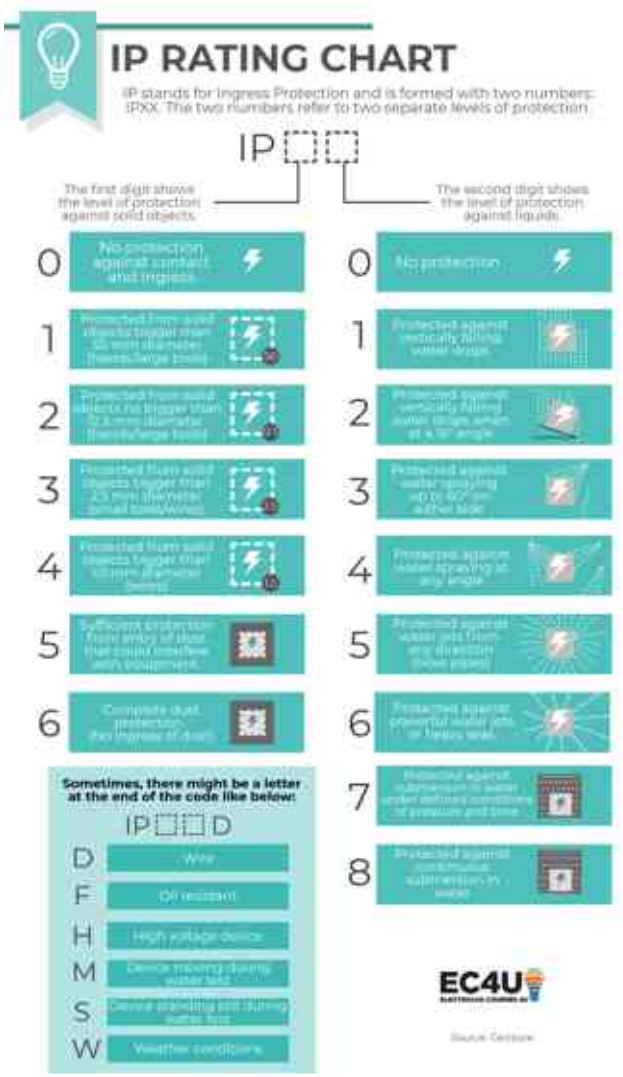
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Bathroom (special area)	SBC 1102 Section 4301	Comply with requirements for installation areas in damp and wet environments Protective goal: Creation of permanently safe functionality	- Check and document whether the necessary installation requirements in the bathroom area (bath, etc.) have been complied with	
Communication and data systems				
Wire routing, bus systems, etc.	SBC 1102 Section 3802	Proper control and function of the electrical and building services systems and equipment Protective goal: Assure permanent operationally secure controls and functions	- Check whether effectiveness, operational security and proper function reliability are complied with (e.g. observe separation of bus systems, etc. to 220/380 V - 60 Hz systems/routing)	 *Security system*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Emergency power system (optional)				
Emergency power system		Utilisation of the effective and operationally secure function of the emergency power system Protective goal: Creation of permanently safe functionality in the event of a mains power failure	- Check using spot-checks and document whether the emergency power system is effective and operationally secure – shut-off conditions in emergency power system operation complied with, etc.	 *Check whether the emergency power system is effective and operationally secure*
Tests				
Functional test		Utilisation of the effective and operationally secure function of the electrical installations Protective goal: Creation of permanently safe functionality	- Check using spot-checks and document whether the electrical installations are effective and operationally secure	
Tests (initial testing)	SBC 1102 Section 3402	Visual checks, functional checks and measurements Protective goal: Creation of effective and operationally secure electrical systems	- Check and document whether the initial testing logs ("Test reports") have been properly filled in and the tests carried out (spot-check measurements, etc.)	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Documentation				
Operating instructions		For timers, data and communication technology, regulations (bus systems), etc. Protective goal: Creation of permanently safe functionality	- Check and document whether corresponding, operating instructions formulated for a layman are available	
As-built drawing		As-built drawing with dimensions Protective goal: Creation of permanently safe functionality	- Check and document whether there is complete documentation existing that properly represents the as-built status	
Maintenance, care and servicing instructions		Instructions for preventative maintenance, battery replacement, etc. Protective goal: Creation of permanently safe functionality	- Check and document whether corresponding, instructions formulated for a layman are available	

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
General	The requirements stated in the code are intended to ensure the safety of persons, livestock and property against dangers and damage, which may arise in the reasonable use of electrical installations. The major types of risk in electrical installations are: 1. electrical shocks. 2. excessive temperatures likely to cause burns, fires, and other injurious effects. 3. ignition of a potentially explosive atmosphere.		
Socket-outlets: **SBC 1102** **Section 37-6** **Section 39-1**	**Socket-outlets:** **Power supply:** The power supply for the electrical installation of **socket-outlets** In residential, buildings shall comply with SASO 1899 [3-phase 230 400, 60 Hz] **Note:** 127/220 system is available in existing constructions, but it will be taken out by the year 2035 G. **230 V (single phase)** supply is **recommended** for socket-outlets intended to be used for **residential buildings** and similar uses. **Compliance with standards:** Socket-outlets intended for use in household and similar general use shall comply with the following relevant standards: a) **SASO 2203** for 230 V Socket- outlets.	• Does the installation of socket-outlets comply with SASO 1899 [3-phase 230 400, 60 Hz]? • Do 230 V socket- outlets comply with SASO 2203 and 127 V socket- outlets comply with SASO 2204? • Are the ratings of socket-outlets 230 V/13 A? • Are socket-outlets installed in the floor IP24 protected? • Are socket-outlets located outside the building IP24/IP25 protected? • Do the colors of the conductors comply the code requirements? • Are the number of socket-outlets per circuit exceed 8? • Is the cross-sectional area of copper conductors less than 2.5 mm^2? • Do socket-outlets in the kitchen comply the code requirements?	An **IP rating** stands for **"Ingress Protection"** (of Water and Dust) " It is an international standard used to rate the effectiveness of sealants against moisture and dirt. Each IP rating has two digits: 1) The first rates effectiveness of sealants against solids 2) The second against water. The higher the number, the greater the protection. 

	b) **SASO 2204** for 127 V Socket- outlets **Operational conditions Ratings**: Unless otherwise specified in this Electrical Requirements, ratings of **socket-outlets** for household and similar general use shall be **230 V/13 A.** Socket-outlets **installed in the floor** shall have a degree of protection at least **IP24** and IK08. Socket-outlets to be located **outside the buildings** shall be: • protected against water **splashing** (IP24). • (IP25) in locations likely to be sprayed with **water jet**. The **colors** of the conductors shall be according to 51-4.2 of chapter 51 in SBC 401. **(Table 51-2)**: • L1: Brown. • L2: Black. • N: Blue. **Cross-sectional areas of conductors** • Only **copper** conductors for socket outlets circuits shall be used. • Unless otherwise specified, the **number** of socket-outlets **per circuit** shall not **exceed 8.** • **Cross sectional** area of copper conductors shall be not less than **2.5 (mm²).** **Socket-outlets for kitchen:**	• Are socket-outlets installed so that no point is more than 2 m horizontally from a socket-outlet? • Are the mounting heights of socket-outlets comply the code requirements?	

	• Socket-outlets shall not 'be an integral part of lamp holders.
	• If **more than 8 socket-outlets** are be installed in the **kitchen**, a **second circuit** shall be used.
	• In no circumstances will sockets outlets installed in the kitchen be permitted to be connected to circuits comprising socket-outlets in other rooms.
	• Socket-outlets in the kitchen shall be of shuttered type
	• Socket-outlets shall be connected to their individual circuit:
	  ○ from the **distribution board**
	  ○ using **4 mm² copper** conductors' cable for all live and earth conductor.
	
	In every:
	• dining room,
	• sitting room,
	• bedroom and
	• similar rooms with general access,
	
	excluding kitchens, bathrooms, toilets and showers, socket-outlets shall be installed so that no point along the floor line of any wall is more than **2 m horizontally from a socket-outlet.**
	
	Mounting heights of socket-outlets:
	• **For indoor installation**: Except where otherwise specified, all socket-outlets shall be mounted at a height not less than **300 mm** above the finished floor or any working surface.
			
			IP rating chart

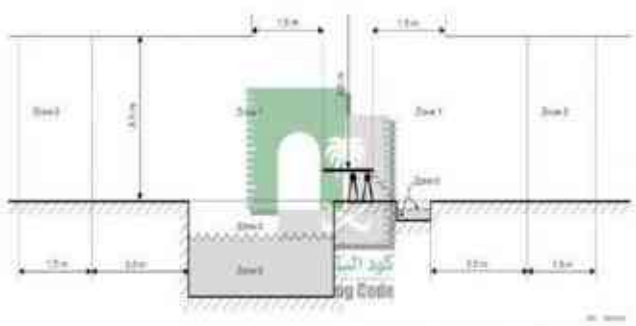
	• **For Arabic Majles**: socket-outlets shall be mounted at a height to be agreed between the owner and the installer but not less than **700 mm.** • **Outside the buildings**: socket-outlets shall be installed at a height of **one meter** above the ground. • **In the kitchen**: socket-outlets shall be mounted **300 mm** above **worktop** (workbench) level as a minimum height.		Table 51-2 Identification of conductors by colours and alphanumeric marking (SBC 401) Function / Alphanumeric / Color AC power circuit Phase of single-phase circuit / L / Brown Neutral of single- or three-phase circuit / N / Blue Phase I of three-phase ac. Circuit / L1 / Brown Phase 2 of three-phase ace Circuit / L2 / Black Phase 3 of three-phase ac. Circuit / L3 / Grey  *Are socket-outlets installed so that no point is more than 2 m horizontally from a socket-outlet?*
	Socket-outlets: protection for safety		
	All devices used for **isolation** shall be clearly identified, for example by marking, to indicate the circuit which they isolate. **Protection against direct contact:** • Socket-outlets shall be so installed that when they are mounted and wired as for normal use, **live parts** are **not accessible**, even after removal of parts which can be removed **without** the use of a tool.	• Are all devices used for isolation clearly identified? • Are live parts of socket-outlets accessible? • Are socket-outlets equipped with shutters? • Are socket-outlet mounted at a distance less than 600 mm measured horizontally from any tap sink, basin in any kitchen? • Are socket-outlets liable to come into physical contact with fabrics or other flammable materials?	

	• Socket-outlets shall be equipped with shutters. **Additional protection: residual current protective devices (RCDs):** The use of RCDs with a rated residual operating current **not exceeding 30 mA**, is recognized in AC systems as an additional protection in the event of: • failure of the provision for basic protection and/or • the provision for fault protection or • carelessness by users. **Note** the use of high sensitivity residual protective devices provide **additional protection** against direct contacts in the event of the failure of other protective measures. **Protection against indirect contact** (through water or appliance bodies)**:** a) Socket-outlet shall not be mounted at a distance less than **600 mm** measured horizontally from any tap sink, basin in any kitchen, etc. b) This protection can be achieved by using: • class II appliance with a plug according to SASO 2203 but with the earthing pin to be dummy. • socket-outlets, each one is supplied by an isolating transformer. **Protection against thermal effects and fire:** • Socket-outlets shall not be mounted at locations where they are liable to **come into physical contact with fabrics or other**	• Are socket-outlets installed above cooking appliances? • Is the horizontally measured distance from a cooking appliance to the socket-outlet less than 600 mm? • Are every circuit protected from overcurrent by a protection device?	  RCD breaker  RCD socket

	flammable materials that may catch fire due to transmission of heat. • Socket-outlets shall not be installed **above cooking appliances**. socket-outlet shall be located not less than **600 mm** measured horizontally from a **cooking appliance**. **Protection against overcurrent:** • Protective devices shall be provided to break any **overcurrent** flowing in the circuit conductors of sock-outlets. • Every circuit shall have at its origin on the phase, a **protection device against overcurrent.** • Overcurrent protective devices (circuit breaker or fuse) shall be according to 43-2.1 of chapter 43 in SBC 401 and shall satisfy the requirements of 43-3 and 43-4.5. 1.		
Lighting system **SBC 1102** **Section 1104** **Section 4009** **Section 4105**	**Lighting equipment**		
	Lighting equipment Use the following steps to determine the **interior lighting** power allowance: • The lighting power **density** for residential building area types is **10 watts/m².** • Determine the **gross** lighted floor **area** in square meter of the building area. • **Multiply the gross** lighted floor **areas** of the building area **times** the lighting **power density**.	• Is the interior lighting power density less than 10 watts/m²? • Is natural lighting provided to the space?	

			 *Lights types*
	LUMINAIRES IN SPECIFIC LOCATIONS		
	Luminaires installed in **wet locations** shall: • be installed so that water **cannot enter or accumulate in wiring** compartments, lamp holders, or other electrical parts. • have at least **(IPX4)** unless otherwise specified in other parts of this Electrical Requirements. **Note:** **IPX4**: Is resistant to water splashes from ***any direction***.	• Are luminaires installed in wet locations have at least (IPX4) protection?	
	ELECTRIC APPLIANCES		
	Individual circuits for electrical appliances: The individual circuits shall be complying with the following: • The rating of an individual circuit shall **not be less than** the **rated current of the appliance** or the rating of an appliance having combined loads.	• Is the rating of an individual circuit less than the rated current of the appliance/appliances? • Are the appliances having a rated current of more than 15 A in case of 127 V or more than 13 A for voltage 230 V supplied from an individual circuit? • Are circuits supplying washing machines protected by RCD?	**41-5.1 of SBC 401: Additional protection: Residual current protective devices (RCDs)** • **41-5.1.1:** The use of RCDs with a rated residual operating current **not exceeding 30 mA**, is recognized in AC systems as an **additional protection** in: • the event of failure of the provision for basic protection • and/or the provision for fault protection • or carelessness by users.

	• Any appliance having a rated current of **more** than **15 A** in case of **127 V** or **more** than **13 A** for voltage **230 V,** sockets-outlets ratings shall be **supplied from an individual circuit.** **41.8.1 Washing machines** • Circuits supplying washing machines shall be protected by **RCD** in accordance with **Section 41-5.1 in SBC 401.** • Accessible metal parts of **class-I** washing machines, **which may become live in the event of insulation fault**, water tub and the other metal parts, which touch the water, shall be **permanently** and liable **connected to an earthing termina**l within the washing machine. **Electric water heaters:** • Water heaters shall be supplied from a **separate circuit** and through double pole switch. • Water heaters shall have exposed earthing terminal which all non-current carrying metal parts of water heater are connected to it. • Circuits supplying **instantaneous**-type water heaters shall be protected by **RCD** in accordance with 41-5.1. of SBC 401. **Electrical oven** Electric ovens use 240-volt current and require **two-pole** circuit breakers--two single-switch circuit breakers tied together--as protection for the circuit.	• Are accessible metal parts of class-I washing machines permanently and liable connected to an earthing terminal within the washing machine? • Are water heaters supplied from a separate circuit and through double pole switch? • Are circuits supplying instantaneous-type water heaters protected by RCD? • Are electric ovens which use 240-volt current equipped with two-pole circuit breakers?	**41-5.1.2**: The use of such devices is **not** recognized as a **sole means of protection** and does not obviate the need to apply one of the protective measures specified in 41 -1 to 41-4 of SBC 401.   Electrical Oven
Swimming pools and other basins	**Swimming pools:** **Electrical installations** of:		

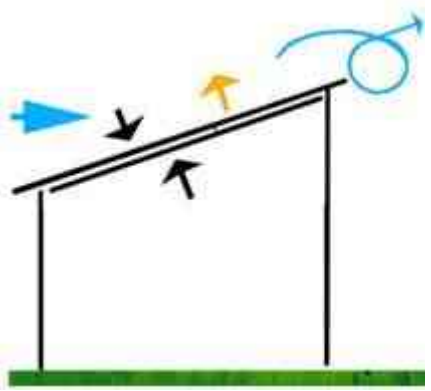
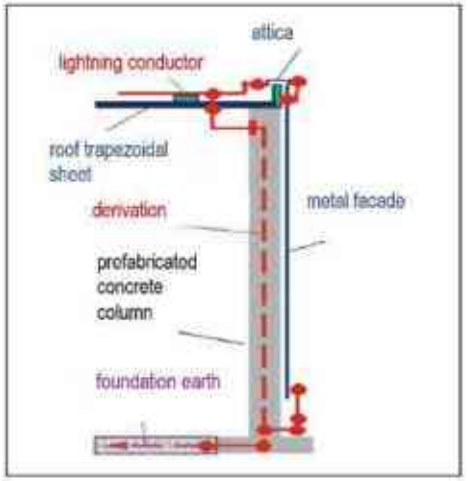
SBC 1102 Section 4201	• basins of swimming pools and their surrounding zones • paddling pools and their surrounding zones • basins of fountains and their surrounding zones. Shall comply with the requirements of chapter **42 of SBC 1102**. The requirements of chapter 42 are based on: a) The dimensions of **three zones**: • Zone 0, • Zone 1 and • Zone 2. **b)** The requirements of **chapter 36**.	• Are electrical installations of swimming pools and their surrounding zones comply with the requirements of chapter 42 of SBC 1102?	 Zone dimensions for swimming pools and paddling pools (side view) (Copy SBC 1102, page 954)  Minimum IP number per zone (Copy SBC 1102, page 950)
Inspection **SBC 1102 Section 34-2**	**Inspection requirements** **Initial verification:** Electrical installations shall be tested and inspected: • before being placed in service and • after any important modification to verify proper execution of the work in accordance with this Electrical Requirements (see Part 6 of SBC 401). **Periodic verification:** The person carrying out inspection and testing shall make a recommendation for subsequent periodic inspection and testing (see Part 6 of SBC 401).	• Are electrical installations tested and inspected by an electrical professional before being placed in service?	

8.20 Mechanical / Electrical / Plumbing: Plumbing part

Technical Craft

Metal Works / Cladding

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Chapter is included to create the awareness of potential chemical reaktion due to the installation of different types of Metal.				
Plumbing work - Durability - Fitness for purpose - Visual appearance	**Plumbing work – areas of activity**			
	SBC 1101 Section 3C15 Section 8A3		External wall cladding made of metal sheets - as weather protection - as waterproofing - as design element (decorations, cornices/mouldings, and similar) Exceptions: External wall structures made of concrete or masonry do not require any cladding,	 *External wall cladding*
	SBC 1101 Section 3C15 Section 8A3		Roofings - Roofing made of metal - panels / plates - Roofing made of metal - shingles	
	Cladding work – basic requirements			
	SBC 1101 Section 3C15 Section 8A3 Construction documents	Material resistance	- Material selection - Corrosion protection - Place of installation	 Copper sheet

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	SBC 1101 Section 3C15 Section 8A3 Construction documents	Resistance to wind loads / wind suction	- Type of fixing - Fixing technology	 *Resistance to wind loads / wind suction*
	SBC 1101 Section 3C15 Section 8A3 Construction documents	Protection from external effects	- Earthing systems - Weather protection	 *Earthing systems*

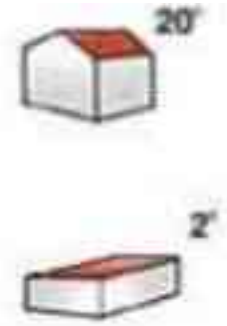
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
	Construction experience	Material selection	Electrochemical processes can cause damage / destruction of metal sheets. ⇨ Have the connector material and sheet metal cladding material been matched with each other? ⇨ Have different materials been mixed for the metal cladding? ⇨ Do bitumen sheets and sheet metal cladding come into contact with each other / are connected together?	 *Electrochemical processes can cause damage / destruction of metal sheets.*
	Construction experience	Material selection Material verifications	Material deliveries to the construction site Material deliveries must be marked by the manufacturer ? ⇨ Are material certificates issued by the manufacturer available and do these correspond to the delivery details (delivery note, product marking)?	
	Construction experience	Use/installation Expansion behaviour	When using / installing metal covers and built-in metal parts, the dimensions of the metal sheet that can be installed must therefore be taken into consideration and also whether options have to be provided for compensation of metal expansion/extension. Extension / movement compensating measures must be provided, depending on the type of material selected (copper sheet, zinc sheet, aluminium sheet, steel sheet). These can be implemented as a built-in	 *Compensation of metal expansion/extension*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
			part or in the form of different joints. ⇨ Taking into account the basic climate conditions, are expansion compensating measures required?	
	Plumbing work – external cladding EXTERIOR WALLS			
	SBC 1101 Section 3C15 Section 8A3 Construction experience	Material selection	Material thickness from (suitable / tested material thickness without further verification) Minimum thickness of weather coverings - Aluminium cladding 0.5 mm - Cold-rolled copper sheet 0.6 mm - Copper shingles 0.4 mm - Load-coated copper 0.6 mm (Lead-coated copper) - High-strength lead-coated copper 0.4 mm (Lead-coated high-yield copper) Tested materials, which are verified as being suitable by testing, can have different material thicknesses. ⇨ Check / examine manufacturer's documents	
		Material selection	Aluminium sheet must comply with the AAMA 1402 requirements.	

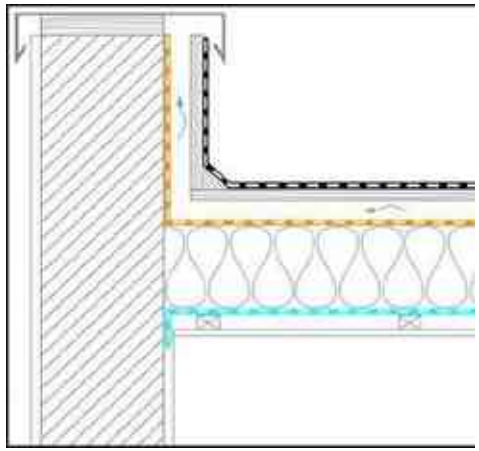
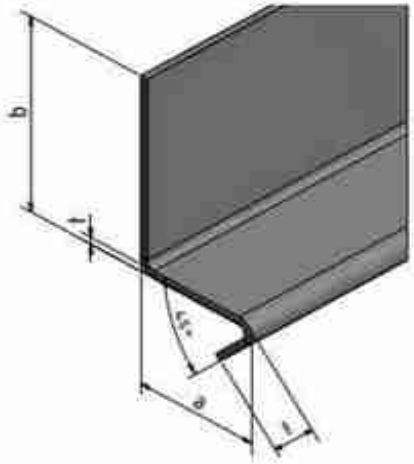
Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Material selection -	Metal flashings Use of corrosion-resistant or anti-corrosion protected material (enamelled, metallic coating, electroplated, paint coat). ⇨ Coated metal sheets should be at least 0.378 mm thick	 *Coated metal sheets*
		Building physics effects - condensation -	Protection against condensation in the exterior wall assembly shall be provided in accordance with the SBC 602	
		Building physics effects - condensation -	External wall claddings must be formed with a vapour barrier. ⇨ Wall construction design must include building physics construction details Exceptions: External wall structures made of concrete or masonry do not require a vapour barrier ⇨ Check - is the installation of a vapour barrier required for the wall structure??	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Protection from external effects - weather protection -	Flashings / caps / drip edges / drip plates The installation of flashings / drip plates or edges / caps is recommended wherever water can penetrate the external wall or where water is to be drained to the outside. ⇨ Details of this given by way of example	 *External cladding*  *External cladding*
		Resistance to wind loads / wind suction -	Flashings The fixings are to be designed for a wind load / wind suction, however, for at least 0.958 kg / m².	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Structural execution	Exposed / water-exposed connections / edges / ends / penetrations must be sealed with permanent / ageing-resistant sealant material. ⇨ Are all ends / penetrations covered / sealed with a suitable sealing material?	 *Are all ends / penetrations covered / sealed with a suitable sealing material?*
		Protection against external effects - lightning -	Metal cladding must be earthed according to the SBC 401 requirements. ⇨ Are safe connections made to the earthing system? ⇨ Are all components made of metal conductively connected to each other? ⇨ Do additional conductive connections have to be made?	 *Conductive connections*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
Plumbing work - Durability - Fitness for purpose - Visual appearance	**Plumbing work – roofings / spandrel covers (roof parapets)** ROOF ASSEMBLIES AND ROOFTOP STRUCTURES			
	SBC 1101 Section 3C15 Section 8A3 Construction experience	Material selection -	Use of corrosion-resistant material (galvanised). ⇨ Galvanised metal sheets should be at least 0.483 mm thick	 *Galvanised metal sheets*
		Structural execution	The minimum roof slope for metal roofing with only butt overlaps or without watertight underlayer is 25%. The minimum roof slope for metal roofing with butt overlaps and additional sealing of the joints is 4 %. The minimum roof slope for metal roofing with standing seam is 2 %. ⇨ Is the joint constructed according to the actual roof slope?	 *The minimum roof slope for metal roofing*
		Structural execution	The roof slope of roofs with metal shingles may not be less than 25 %. Underlayers are to be installed in compliance with ASTM D 226, Type I.	

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Structural execution	Metal covers/roofings are to be fixed onto the load-bearing structure using fixings tested by the manufacturer. If no information is available from the manufacturer, the following requirements must be complied with: - Roofings made of zinc sheet must be fixed using galvanised connectors - Fixings made of stainless steel are approved for all metal coverings/roofings - Roofings made of copper sheet must be fixed using fixings made of Series 300 stainless steel	  *Metal connectors*

Craft	Basis / Standards	Technical function / quality	Inspection scope	Defects, findings and notes
		Building physics effects - condensation - Construction experience - Construction documents	Metal roofings must be designed with regard to the need for an underlayer to prevent condensation or to prevent negative effects on the metal covering due to contact with the substructure. ⇨ Is a roof structure design available? ⇨ Are installation instruction available from the manufacturer of the roof system? ⇨ Have the design requirements been implemented in the construction?	 *Have the design requirements been implemented in the construction?*
		Structural execution	Drip edges on eaves and gable wall Drip edges must protrude by at least 50 mm. ⇨ Do the drip edges protrude by a sufficient amount? Maximum drip edge fixing spacings 300 mm ⇨ Are the fixing spacings complied with?	 *Drip edges*

8.21 External Works: Landscaping works / external works

Technical Craft

Landscaping works / external works

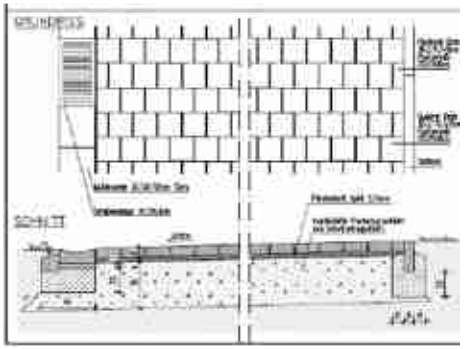
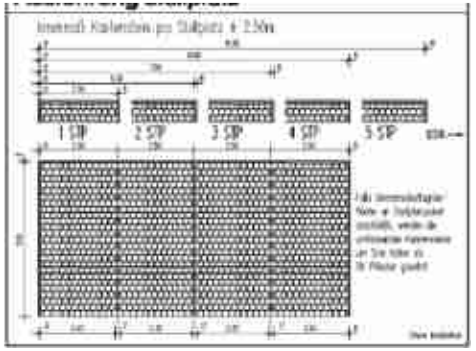
Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	The Saudi Building Code 303 - "Soil and Foundations" essentially relates to earthworks and foundation works. It therefore concentrates on civil engineering, but no landscape and outdoor works and is therefore only conditionally applicable. As outdoor areas are created and landscape works are carried out in classic housing construction in Saudi Arabia, protection objectives must at least be defined and complied with. Visual standards for the execution are also important.	In general, towards the end of construction projects for the erection of residential areas and new developments, the outdoor areas are built alongside the landscaping works. Ideally, the outdoor areas and the pending landscape works are designed. Landscape works and outdoor areas almost always extend up to the buildings. <u>The usual areas of use are:</u> Footpaths and pavements in residential developments, without vehicle traffic Road layouts in residential developments with vehicle traffic for residents, but not usual, high frequency road traffic Footpaths/pavements adjacent to a road Other, non-engineered use areas, e.g. edgings	   *Footpaths/pavements adjacent to a road*

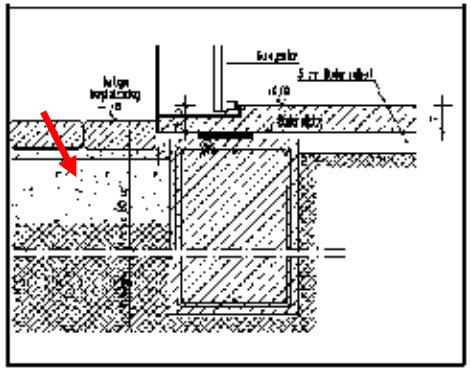
Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
				
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	<u>Protection objectives:</u> - Durability - Strength - Traction - Evenness - Accessibility	For the inspector on site the question arises as to what is planned or designed and, based on this, what loads have to be supported. <u>General road construction questions:</u> - Does a detailed design exist for the landscape work and for the outdoor areas? - Can dimensions, materials, ground modelling, levels, installations such as street lighting, etc. be read from the drawings and compared with the execution? - Is the block paving structure of footpaths / sidewalks described in detail (thickness of the crushed rock base course / thickness of the chippings paver bed)? - Do the edges have concrete haunching and is the haunching adequately dimensioned? - Have the planned paving blocks / natural stones been laid? - Are the blocks level and safe to walk on? - Is accessibility provided, where due? - Have cables and associated materials been laid in the ground at the edges of paths/roads and are they correct for the purpose (e.g. water protected distribution boxes) of road/path edge lighting (bollard lights)? - Are the foundations for path edge lighting adequate?	 *Does a detailed design exist for the landscape work and for the outdoor areas?* 

Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	<u>Questions on surface quality:</u> - Are the joints filled or swept with sand / fine chippings? - Do the curbs wobble? - Have edgings been laid?	 *Do the curbs wobble?*
			- Does edge and surface damage exist?	 *Does edge and surface damage exist?*
			- Are the paving blocks dirty? - Is eco paving agreed contractually? - Has the correct soil been placed in the joints of the eco pavers?	 *Are the paving blocks dirty?*

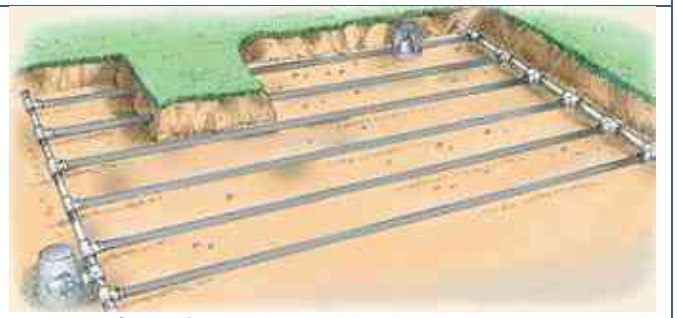
Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	<u>Questions in case of cantilevered walls:</u> - Is the construction of cantilevered retaining walls required at ground level differences? - Are the cantilevered walls plumb? - Do the cantilevered walls have adequate foundations? - Are the backs of the cantilevered walls closed / sealed using sealing strips? - Are the cantilevered walls damaged in the visible areas?	 

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	Questions about steps: - Are the steps laid safely? - Are the rise-to-run ratios complied with? - Is accessibility due (ramps)?	 *Are the steps laid safely?*
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	Questions on joints at structures: - Is the base plaster (rendered plinth) protected against moisture? - Is the waterproofing protected against mechanical damage?	 *Is the base plaster (rendered plinth) protected against moisture?*

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	<u>General road construction questions:</u> The previously asked questions apply. <u>And additionally:</u> - Are road gullies installed? - Have channel / swale blocks been laid? - Is the crushed rock base course bedding adequately thick and load bearing?(Thicker than for road construction) - Are the blocks laid with a slope? - Have flush curbs been laid? - Are there tripping edges between swale/channel and paving blocks?	 *Are the blocks laid with a slope?*
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	<u>Questions on parking spaces:</u> The previously asked questions apply. <u>And additionally:</u> - Are the dimensions of the parking spaces correct? - Are the parking spaces allocated? Have sufficient parking spaces been built?	 *Are the dimensions of the parking spaces correct?*

Craft	Basics/standards	Technical function / quality	Inspection scope	Defects, findings and notes
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	see above	<u>Questions on garages and courtyard entrances:</u> The previously asked questions apply. <u>And additionally:</u> - Are the paving blocks laid lower than the garage and courtyard entrance?	
Landscaping works / external areas	SBC 1101 Section 309 Section 3D5	<u>Protection objectives:</u> - Durability	<u>Questions on landscaping work:</u> - Is tree-felling and uprooting and clearing work required for the execution of the construction work? - Does the construction project require protective measures for trees, existing plants and planted areas? - What design exists for the topsoil work? - Are construction, care and maintenance works planned for sports facilities and playgrounds or have these works been carried out? - Are engineering biology protection measures (e.g. slope stabilisation and erosion control) required / have they been carried out? - Is fencing work required / it is in progress?	 Fencing work example

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
GARAGES AND CARPORTS **SBC 1101 SECTION 309**	**Clear height:** The clear height in vehicle and pedestrian traffic areas in garages and carports, shall be **not less than 2150 mm**. **Garages:** Garages shall comply with Sections 302.5, 302.6, and 309.1 of SBC 1101. Garage floor surfaces shall be: • of approved **noncombustible** material. • The area of floor used for parking of automobiles or other vehicles shall be **sloped** to facilitate' the movement of liquids to a drain or toward- the main vehicle entry doorway. **Garage Fire sprinklers:** Private garages are not required to have sprinklers; however, where a designer chooses to take advantage of reduced separation requirements for a garage wall, it is appropriate for the garage to be provided with sprinklers as a means of property protection. Sprinklers in garages shall be connected to an automatic sprinkler system complies with Section 2904 (SBC 1102).	• Is the clear height of garages and carports, less than 2150 mm? • Are garage/carport floor surfaces of approved noncombustible material? • Are garage/carport floor surfaces sloped to facilitate the movement of liquids to a drain or toward- the main vehicle entry doorway? • Are the private garages required to have sprinklers? • Is the sprinkler system in garages connected to an automatic sprinkler system complies with Section 2904 (SBC 1102)? • Are the automatic garage door openers, listed and labeled in accordance with UL 325? • Do carports open on not less than two sides?	  *Are garage/carport floor surfaces sloped to facilitate the movement of liquids to a drain or toward- the main vehicle entry doorway?*

Craft	Technical function / quality	Inspection scope	Defects, findings, and notes
	Automatic garage door openers: Automatic garage door openers, **if provided**, shall be listed and labeled in accordance with **UL 325**. **Carports:** • Carports shall be **open** on not less than **two sides**. • Carport floor surfaces shall be of approved **noncombustible** material. **Asphalt** surfaces shall be **permitted** at **ground level in carports** • The area of floor used for parking of automobiles or other vehicles shall be **sloped** to facilitate the movement of liquids to a drain or toward the main vehicle entry doorway. • Carports **do not open** on two or more sides shall be considered to be a **garage** and shall comply with Sections 302.5, 302.6, and 309.1 of SBC 1101		
SUBSURFACE LANDSCAPE IRRIGATION SYSTEMS **SBC 1102 SECTION 3009**	Materials, design, construction and installation of **subsurface landscape irrigation systems** connected to **nonpotable water** from **on-site** water reuse systems shall comply with Section 3009 of SBC 1102.	• Does the subsurface landscape irrigation systems connected to nonpotable water from on-site water reuse systems comply with Section 3009 of SBC 1102?	 *Subsurface landscape irrigation systems*

فحص جودة البناء

9.0 Inspection Checklists (extract)

Holdpoint 1 Inspection

Craft sections	Subsection	Inspection task	Checkpoints	Remarks
			Strip and single pad foundations (footings) are not concreted.	
Preparation	prerequisites	construction status	The drainage pipes are installed.	
			The foundation earth electrode is installed.	
		Earthworks / foundations	Quality of the construction pit floor	Any ciritcal informattion in the reports
Grounding	Excavation	Subsoil compaction	Soil condition assessment	Sufficiency of compression ratio to be checked
		Slopes	Protection in regards to surface water intrusion	Highest ground water level is missing
	Working space	Clearance	Working space too narrow / slope ratio inappropriate	
Foundation preparation	Slope	Protection in regards to surface water intrusion	Foil coverage	
	Water level	Drawdown	Level check	
		Permit	Check needed permits, level of drawdown and pollution protection	If applicable
Dewatering works	Building pit	Ground water pollution	Check implemented measures	If applicable
		Minimum decline	State decline factor	If applicable

10.0 References

The following materials were user in this book:

- The Saudi General Building Code SBC 201.
- The Saudi Building Code for Soils and Foundations SBC 303.
- The Saudi Electrical Code SBC 401.
- The Saudi Mechanical Code SBC-501.
- The Saudi Energy Conservation Code Except Residential SBC-601.
- The Saudi Energy Conservation Code for Residential Buildings SBC-602.
- The Saudi Fire Code SBC-801.
- The Saudi Residential Building Code SBC (1101-1102).


وزارة الشؤون البلدية
والقروية والإسكان


البناء المستدام
Sustainable Building


كود البناء السعودي
Saudi Building Code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