**Work Method – Concrete Curing**

GC Construction Ltd



Image above shows curing of concrete slab by the use of polyethylene sheet as cover

May 19, 2019; Reviewed and comment May 22 by Faculty Advisor.

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# SIGNATURE PAGE

As an Approver, with my signature, I confirm that this Work Method is the plan for construction of the work. If the plan changes, I will inform the Originator so that the Work Method can be revised. Alternately, I will make revisions myself and reissue to those that require copies.

As a Reviewer, my signature confirms that I have reviewed the document and any comments to the WM have been provided to the Originator and/or to the Approver.

This Work Method

GC Project Manager

Name: Date: \_\_\_\_ \_\_ Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

GC Site Supervisor

Name: Date: \_\_\_\_ \_\_ Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Initial Reviewer

Name: Date: Title: Signature:

# Background information on concrete curing

**CSA (Canadian Standards Association) A23.1(in Canada) ACI (American Concrete Institute) (in United States) are generally recommended as sources for concrete practices including curing.**

Curing is the maintaining of adequate moisture content and temperature in concrete in early stage, after the pour, so it can develop properties required from the design and mixture. Curing begins immediately after placement and finishing so that the concrete may develop the desired strength and durability.

Without an adequate supply of moisture, the cementitious materials in concrete cannot react to form quality product. Drying may remove the water needed for this chemical reaction called hydration and the concrete will not achieve its potential properties.

Temperature is the other important factor in proper curing, since the rate of hydration, and therefore, strength development is faster at high temperatures. Generally, concrete temperature should be maintained above 10 degree centigrade (50 degrees Fahrenheit) for an adequate rate of strengths development. Further, a uniform temperature should be maintained through the concrete section while it is gaining strength to avoid thermal cracking.

For exposed concrete, relative humidity and wind conditions are also important; they contribute to the rate of moisture loss from the concrete and could result in cracking, poor surface quality and durability. Protective measures to control evaporation of moisture from concrete’s surfaces before it sets are essential to prevent plastic shrinkage cracking.

Proper curing of the concrete gives us the following benefits:

1. Strength gain: Laboratory tests shows that uncured concrete in a dry environment lose up to 50 percent of its potential strength compared to a similar concrete that is moisture cured. The surface of the concrete will be most effected. Also, concrete placed under high-temperature conditions will gain early strength quickly, but later strength may be reduced. Concrete placed in cold weather will gain strength more slowly, delaying form removal and subsequent construction. As long as the fresh concrete is above freezing and doesn’t freeze until 70% of its 28-day strength is gained, concrete poured in cool or cold temperatures will be fine. But should concrete freeze prior to gaining strength noted above, the concrete will exhibit significant and permanent strength and durability reductions.
2. Improved durability: Well cured concrete has a better surface hardness and will better withstand surface wear and abrasion. Curing also makes concrete more watertight, which prevents moisture and waterborne chemicals from entering into the concrete, that results in increasing durability and service life.
3. Better serviceability and appearance: A concrete slab that has been allowed to dry out too early will have a soft surface with poor resistance to wear and abrasion. Proper curing reduces crazing, dusting and scaling.

In cold weather, concrete shall not cool faster than a rate of 3 degree centigrade per hour for the first 24 hours. Concrete should be protected from freezing until it reaches the compressive strength of \_\_\_\_\_\_\_\_\_ using insulating materials and/or introduced heat in containment.

Critically, concrete should be protected from freezing until it attains a minimum compressive strength of 500 psi (3.5 MPa), which is about two days (48 hours) after placement for most concrete that is maintained at 50°F. Some specifications are more strict and the temperature of substrate and ambient temperature of air are important factors.

The following are the common method for concrete curing:

**Moisture Loss Prevention:**

* Curing compounds: (Not used, unless required/approved by the Owner’s Rep)

Form a membrane over the top surface of the concrete preventing moisture loss

Should be applied in two applications with the second being at right angles to the first to ensure uniform coverage

Should be applied as soon as the concrete surface is finished and when there is no free water on the surface

Must be applied at the manufacturer’s suggested application rate

Confirm that this curing method is suitable for the final floor covering application

* Plastic sheeting:

Ensure that the plastic sheeting covers 100% of the concrete surface and that it is adequately sealed at the edges to prevent moisture loss (water may be added to the surface prior to the application of plastic)

Select the appropriate color (white, black, or clear) of the plastic depending on the ambient air conditions(heat/cold)

If uniform color is a requirement for the project, this method may not be suitable

Ensure that plastic sheeting is not damaged by the subsequent construction activities during the curing period

* Leaving Formwork in Place

This system is most effective for vertical elements (wall, columns, beams, etc.). Care must be taken to also protect the top surface of the concrete appropriately

“Breaking” or “releasing” of the formwork will dramatically reduce the effectiveness of this curing since the air flow becomes possible between concrete and the formwork

If uniform color is an issue, uniform curing time and temperature must also be maintained, and form removal must be schedule accordingly

**Supplying Supplemental Moisture**

* Water Ponding

Flooding of the concrete surface to provide both moisture and a uniform curing temperature

Curing water should not be more than 12°C cooler than the concrete temperature to avoid the possibility of thermal cracking

The water must cover the entire concrete surface

* Water sprinkling

Spraying water over the concrete surface. The entire concrete face must be wet for this method to be effective

The concrete surface must have sufficient strength to avoid damaging the surface

Excess water will run off the concrete and must be drained away

This protection method can be adversely affected by high winds which prevents proper curing of the high wind due to uneven temperature distribution

* Wet blanket, geotextile and coated paper

Pre-soaked blanket is applied to the concrete surface and is covered with plastic to prevent moisture loss or water is reapplied as necessary to prevent the material from drying out

Blankets should be cleaned and rinsed prior to use to avoid the possible staining.

Materials utilizing both geotextile fabric and plastic top coating can be reused throughout the project

In addition to the methods above, if concrete pour was necessary in cold temperature, concrete must be preserved above 5 degree Celsius (40 F) for the first 48 hours (ACI 306). Such cases require CEO’s decision for the method used (heat blanket, etc.)

To learn more about concrete and concrete curing visit CSA A23.1. See also: <https://www.youtube.com/tyler_ley>

# Proponent and Project Description

**Company Name: GC** (originally Hepco)

**Company type of service:** GC is a family construction company that performs residential developments and contracting in West Vancouver. The company’s vision is to expand its quality work in developments and contracts.

**Project Description:** In residential developments, GC manages construction projects to build residential houses mostly in West Vancouver.GC performs some of the main construction activities and manages the remaining subcontracted activities.

**Work Method Activity Description:** This Work Method (WM) provides the required details of how the concrete curing is carried out and is subjected to a checklist to assure the optimum results. This Work Method will be used in order to ensure full compliance with GC’s quality policy and Quality Plan, required concrete specifications, and BC Building Codes.

**Work Method Scope:** This work method shall apply to all curing’s for all concrete pours (Including the ICF, Insulated Concrete forms) performed by GC depending on the weather and environmental conditions at the time of concrete pour is performed to obtain the optimum curing for the project requirements; given that the grade, forms, and concrete pour is performed accordingly.

**Limitation of liability: Any organization engaged as a Contractor or Subcontractor (the Contractor) agrees to use this Work Method only under the condition that those that wrote and developed this Work Method are to be held harmless for any errors or omissions, any inaccuracies in content resulting in any damages to property or any injury to any personnel that may be involved. It remains the sole responsibility of the Contractor to review any and all items contained in the above Work Method and to make any changes that may be required in order to satisfy any project specification or any regulatory or statutory obligation. As well, the Contractor shall review any and all suggested methods as contained herein and shall make any changes required and shall reissue prior to commencement of construction in order to achieve the specified product or to provide a safe work site for all workers involved. Ownership and final responsibility for the use of all Work Methods remains with the Contractor.**

# PURPOSE and SCOPE

**Purpose**: To define the responsibilities, describe methods and documentation to be used for concrete curing for GC’s projects.

**Scope**: This work method applies to all activities required for concrete cureing at (the address of the project). Reference Standards include construction documents (concrete specifications requirements in the construction engineering plan) and will govern over any procedure included in this document. Not only should the concrete mix abide by the requirement, also the curing process must be done accordingly to both achieve concrete strength requirements, as well as, the concrete surface look and durability.

# Acronyms

GC, (originally Hepco – Hepco Construction Ltd.)

PM - GC’s Project Manager

QC - Quality Control

WM - Work Method

WP **-** Work Procedure

ITP - Inspection and Test Plan

DWV - District of West Vancouver

SWP – Safe Work Practice

# RESPONSIBILITIES

* **Project Manager (PM)** is responsible for project scheduling, and final approving the inspections, tests, and changes. Also, in charge of identifying necessary resources and assigning individual responsibilities to run and monitor the quality control procedure that defined by GC’s QP and this WM. He is responsible for overseeing the Quality Management Plan, enforcing project construction standards, the creation of work method documents by providing appropriate sequence and task definitions, executing the project, scheduling and delegation of the roles of quality assurance inspections, safety, environmental items and subcontractor coordination.

The PM is accountable for the Site Superintendent’s responsibilities as well. The PM performs a WM review and makes changes, if necessary, to any clause so that it is consistent with best practice, consistent with the building code of the Province, and consistent with local conditions. Issues should be reviewed by email with the CM.

* **Site Superintendent** must be a good communicator and is responsible for:
  + Overall site activities; applying project methodology and enforcing project construction standards; organizing field staff and ensuring they perform as required; and supervising Contractors and ensuring they perform as required
  + Assisting the PM and the Subcontractors in the creation and execution of work plans including revisions to these plans as necessary.
  + Assisting the PM in supervision of Contractors’ work quality.
  + Working closely with and support the Contractor to identify potential risks/opportunities, discuss necessary changes, and conduct the inspections.
  + Scheduling and monitoring each workday with appropriately resources.
  + Serving as the representative of and primary contact with the PM.
  + Attending review meetings.
  + Maintaining site logs and other documents in jobsite.
  + Ensuring the jobsite safety and ensuring that safety practices are followed.
  + GC’s Site Supervisor must monitor all the pouring and curing activities to eliminate any costly errors in the forming, pouring, and curing of the concrete in any stage which includes foundation, slabs, or etc.

* **The subcontracted team for the concrete pour:** refers to the company that is bound by contract to GC for the proper concrete pouring. For their scope, the Contractor is responsible for environmental control, safety controls, and quality control for self-performed work. During the subcontractor review meeting, the project manager must demand a proper concrete pour without any defects particularly in areas that concrete is visible. The required concrete levels on forms shall be indicated, checked, and approved by the GC’s PM prior to the pour. The Contractor shall assign a representative who will permanently attend at the job site when the job is being done. The Contractor’s site representative shall ensure following the guidelines and/or Standard Specifications outline on this work method. Proper vibration treatment is key to neat curing and key to proper consolidation of concrete.

# SAFETY AND ENVIRONMENT

* 1. All construction activities and job procedures shall conform to
  + WCB Regulations and other applicable codes, regulations and acts
  + Site safety procedures
  + Discharged water management (Environmental Protection)
  + DWV Bylaws (Noise, Traffic, and Environmental Protection)
* All work process shall be fully consistent to DWV Bylaws, and Sediment and erosion control methods may need to be applied to eliminate or reduce the damaging effects of possible concrete wash off during the curing

[These next items don’t belong in Safety or environment, maybe they are part of preparation.]

* 1. After the pour completion the Site Superintendent must ensure that all the fresh pours are marked clearly and visibly to avoid any unwanted damage (foot prints in fresh concrete for example) to the pour.
  2. If rain was in forecast all the poured concrete sections shall be covered by polyethylene sheets to significantly reduce concrete wash off water while help the curing process.

**Note:** GC does not pour concrete during the Vancouver winters to eliminate risks of bad or inconsistent concrete curing. Unless, it is required by the CEO; in which case insulated blankets will be used to ensure the proper temperature concrete curing.

* 1. If weather is warmer than 25 degrees C and with low humidity or with wind, the drying effects will commence even prior to concrete setting as the surface water will begin to evaporate. In such conditions “fogging” of the concrete surface by means of a pressure washer with the wand pointed into the air creating a mist is recommended. [Sprinkling of the concrete surface with water from a normal water-hose hand sprinkler during finishing will deliver too much water and will weaken the concrete surface.] Curing should start as soon as the bleed water is absorbed or evaporated [perhaps 30 – 60 minutes in hot windy conditions and as soon as the finishing is completed and the poly will not leave an imprint.

**“If it dries then it dies.”,** David Suchorski (Former chairman of ACI )

# SUBMITTALS

The curing process is performed by GC’s Project team. Prior to the concrete pour the followings are required:

* The approval of forming completion checklist (must add, check if oil is applied forms internal surface, if concrete paper covered sheeting is not used.)
* Finalized WM, checklist and any other documents required no later than 7 days prior to the work start time (PM approval is required)
* A copy of approved concrete batch sheet upon delivery (Approved and signed by supervisor
* Documented processes and submittals to enable the PM review

GC requires the supervision and inspection of Site Supervisor prior and during the curing, as well as, the form removal process.

# 10. PROCEDURE

## General Requirements

The weather conditions during and after the pour is key in the concrete curing approach for the project. GC often chooses the concrete pour period in temperatures average between 5 and 25 degrees centigrade to ensure the optimum curing performance by a cost-effective and environmentally friendly curing procedure. Prior to the concrete pour the forms shall be covered with the chosen form-oil or resin in during the forming stage.

This Work Method is a guideline used by GC to describe the work process and the process of quality control by conducting the specific Inspections and relevant Checklists. The Concrete Specifications as well as any code and by-law, in particular environmental protection, are the ultimate requirements.

In this Work Method, concrete curing is covered with the following main procedures:

* 10.2 Curing Preparation
* 10.3 Curing Process
* 10.4 Form Removal

To continue the work and proceed to next step, the site supervisor must obtain the approval of PM for the approval of the inspected checklists. The PM shall review the results to check if the results are acceptable. These approved checklists will be documented by PM for the project Quality Control. The following will be the description of curing procedures.

## Curing Preparation

* + 1. Ensure that a water discharge management mechanism is in place. Unless restricted, GC creates a hole in a corner with lower elevation to collect and manage the runoff water.
    2. Inside of the forms must be either covered with suitable resin mix (oil) or paper-faced plywood forms shall be used. This step helps to prevent sticking of the concrete to forms. The shape and look of the resulted concrete structure depend on preparation of the forms for the pour. (Do not allow the oil to get on rebars)
    3. Check to make sure forms and braces are solid and re-enforced adequately prior to pour. Any form failure during the concrete pour is unacceptable. Make sure the lower sections of the forms are strengthened and fixed.
    4. Ensure that all the rebars inside the forms are distanced with spacers from the walls. **Read the specification for the allowable distance from concrete surface to rebar.** At least one inch from the wall forms; and two inches of space between rebar and slab’s surface. Make sure rebars will not move during the pour. [Note, parking garages concrete surfaces are orders of magnitude more important to get the spacing correct as road salts will be tracked to the garage floor and this is the cause of rebar corrosion (salts migrating through concrete, or especially through cracks).]
    5. Check and confirm the scheduled pouring date with the Project Manager to make sure he will be present on that date to approve the concrete finishing work.
    6. Confirm the time and date of the concrete pour a week prior to it scheduled time with the concrete supplier and finishing subcontractors. Update the scheduled pour time and date as the scheduled pour date gets closer.
    7. Protect roadside catch basins with a silt control device designed specifically for catch basins.
    8. Complete and submit the Check list for Curing Preparation a week prior to the pour. Presented in the next page)
    9. Upon the concrete delivery, supervisor must collect the concrete batch spec sheet and submit it along with the completed checklist to the Project Manager.
    10. If any of the steps above present a conflict that won’t be resolved (including the weather) for the concrete pouring day, inform the PM for instructions or change of plans.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Concrete pour and cureing preperation Checklist** | | |
| GC | | Project: | |
| **Number** | **Checkpoints** | | Check |
| **1** | The forms are inspected for structural rigidity | |  |
| **Comment** |
| **2** | There are no gaps or weak points that concrete may leak out | |  |
| **Comment** |
| **3** | The inside of the form walls is covered with form oil. | |  |
| **Comment** |
| **4** | **the space between in placed rebars and the form walls is in accordance with specifications** and this will vary with Owner, Design firm, exposure of concrete to road salts, (two inches from top of slab for slab rebars) | |  |
| **Comment** |
| **5** | The wall top elevations are clearly marked inside and outside of the forms by pieces of wood or very visible water-proof marker. | |  |
| **Comment** |
| **6** | All the required supplies (Polyethylene sheets, fogging equipment if conditions warrant) are purchased, delivered, and present on site including water supply | |  |
| **Comment** |
| **7** | Concrete delivery and finishing arrangements are checked and set | |  |
| **Comment** |
| **8** | Does the expected weather forecast following the concrete pour require any additional measures? (ie, sufficient crew members if rainy ) | |  |
| **Comment** |
| **9** | Environmental protection measures are in place for dealing with runoff water.  [In the case of hot weather or cold weather concrete procedures, there may be other decisions to be made that may require checking in this curing preparation checklist.  Both of these may require the temperature of the ordered concrete to be revised – raised for cold weather and reduced by means of ice for hot weather.] | |  |
| **Comment** |

|  |
| --- |
| **Quality Scores and Completion Sign-off** |
| **Inspection#**  Quality 5 4 3 2 1 Notes:  On-Time 5 4 3 2 1 Notes:  Sign and date\*: Cell # / ID #: Signed: Date:  Task has been verified complete and in compliance with requirement except for non-conformances and incomplete items reported above. |
| *Quality Score**5 = 100% NO problems 4 = 1 minor problems 3 = Hotspot or 2-3 minor 2 = 6+ or major problems 1 = Excessive problems*  ***On-Time Score*** *5 = On Time 4 = Late 3 = Late by 1 day 2 = Late by 2 days 1 = Late more than 2 days*  ***Safety Score*** *5 = 100% NO problems 4 = 1 minor problem 3 = Hotspot or 2-3 minor 2= 4+ or major problem 1= Injury* |

## Curing Process

Curing process starts when the concrete pour and finishing is completed. For areas of concrete which will be exposed in the project delivery, GC performs curing by simply applying the curing resin to the specified surfaces.

For the foundation footing, foundation walls, and concrete slabs that will be covered, GC uses water and plastic membrane for at least the first 7 days after the pour. This process ensures the strength and impermeability of the concrete foundation that can perform for decades to come. To achieve the desired result, GC’s standard practice includes the following steps:

**Note:** Considering the risks that the uncured concrete runoff water introduces to the environment and the Vancouver’s rain, GC approaches all of its concrete curing processes by hydrating and covering the poured concrete during the curing period. This satisfies the DWV environmental protection requirements, even if construction site is near a creek. The plastic coverings minimize the amount of water needed for the hydration as well as reducing the acidic concrete wash off during the rain. If the ambient temperature is above 25 degrees centigrade, the top of the (white) plastic coverings are watered by a hose to keep control initial curing temperatures.

* + 1. The at least 0.1mm (6 mil) thick polyethylene standard roll is available in the area that is suitably accessible for the curing process.
    2. Obtain the Project Manager approval of the concrete finish work to immediately start the covering (curing) of the poured concrete.
    3. Start the plastic sheet covering process from the corner of the slab that was finished first.
    4. Once the concrete is sufficiently set-up, sprinkle the slab with enough water to cover the surface. Do not over water in a way that it creates concrete wash off.
    5. Make sure no footing, or top of the basement walls, and especially no slabs are left to dry during the covering procedure. This matter is very important during the hot summer days that concrete surface may dry out in short hours.
    6. Once a slab is hydrated, immediately, apply the polyethylene sheets along the longer length to cover the slabs. Add water as you are applying the poly, as illustrated in the Figure 1 at the right-hand side.
    7. At least one foot of sheets overlap is required to contain the moisture.
    8. Place 2 by 4 or other weights on the overlaps to better seal the moisture in as well as holding the sheets in place against the wind. **Figure 1:** covering the slabs
    9. Make sure the excess covering that is hanging on the sides of the slabs are at least twice as long as the height of the slab; and ensure all corners are secured by weight or nail-boarded to the edges
    10. For footings and basement walls we will cover the top of the form by a polyethylene sheet with a suitable width (minimize waste water).
    11. If dealing with a hot and dry summer weather, application of wet cloth is advised on top of the concrete walls. This way more moisture is held and longer periods; preventing cracks and producing a better impermeable concrete
    12. The plastic covering can be secured to the both sides of the wooden form wall by nail boarding a 2 by ¾ inch pieces of wood to the sides.
    13. Site supervisor must check and hydrate all the concrete surfaces, three times a day for the first 7 days. The first 48 hours requires the full-time attention
    14. Minimum curing period is 7 days. Unless necessary, covers can stay for longer than 7 days for better curing results.

By the proper implementation of the above procedure, GC achieves the best possible concrete performance for the basements as well as the whole structure. Also, many environmental concerns are resolved for the precured concrete wash off water.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Curing Checklist** | | |
| GC Construction Ltd. | | Project: | |
| **Number** | **Checkpoints** | | Check |
| **1** | Plastic polyethylene sheets are firmly placed on the concrete surface and all edges and corners are kept well covered. | |  |
| **Comment** |
| **2** | * There is a minimum 1 foot overlap between all the sheets. | |  |
| **Comment** |
| **3** | The poly sheets are in close contact with the concrete surface. | |  |
| **Comment** |
| **4** | * On slabs, the sheets were placed when the concrete has hardened enough to prevent surface damage. | |  |
| **Comment** |
| **5** | * Wrinkling plastic sheets is not used on the horizontal surfaces. | |  |
| **Comment** |
| **6** | * Environmental protection measures are in place for dealing with possible concrete wash off water. | |  |
| **Comment** |
| **7** | * Water allowed to flow between the concrete and the sheet. | |  |
| **Comment** |
| **8** | * No surface was left to dry at any moment during the first 48 hours | |  |
| **Comment** |

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| --- |
| **Quality Scores and Completion Sign-off** |
| **Inspection#**  Quality 5 4 3 2 1 Notes:  On-Time 5 4 3 2 1 Notes:  Sign and date\*: Cell # / ID #: Signed: Date:  Task has been verified complete and in compliance with requirement except for non-conformances and incomplete items reported above. |
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## Form Removal

If Insulated Concrete Form, ICF, is used, there will be no form removal. ICF walls acts as the permanent insulation.

Form Removal: Form removal causes a faster moisture lost rate from the sides of the concrete walls. Since GC cares to produce the best performance of the structure, particularly the concrete impermeability performance, forms shall be removed no sooner than 7 days after the concrete pour (if early removal of the forms are necessary, then apply the sealed curing by covering the concrete with curing sealant or curing compound). The following are the steps involved in the process:

* + 1. Assemble a sufficient number of crew members for the form removal
    2. If in residential area, do not start the form removal impacts until 8 am
    3. Remove the plastic coverings (wash and roll the reusable sections)
    4. Start from a side, by removing braces and reinforcement structures that hold the forms in place (Start from the top, move towards bottom
    5. Once reinforcements were removed, knock the sides of the panels with a hammer
    6. Hydrate the concrete wall to reduce the concrete dust
    7. If bottom of a form is stuck in concrete, remove the excess concrete carefully
    8. Do not use heavy impact! This may introduce microcrack in the concrete structure that causes significant damage the concrete overtime
    9. Remove the forms by impact and pulling.
    10. Clean (power wash), collect, and store plywood sheets for future uses.
    11. Make sure all the nails are removed from the woods that are for reuse.
    12. Clean, collect and store the reusable woods in a proper place.
    13. Once all of the forms are removed, remove the form tie in the concrete
    14. Break the tip of the tie that is out the concrete wall by twisting it
    15. Remove the remaining plastic of the tie that is in the concrete
    16. Make sure that no ties are left in both sides of the concrete
    17. All the reusable wood is de-nailed, collected, and stored/covered for future use.
    18. Clean up the site thoroughly.

Now, that you have removed all the forms, your curing process is complete; and your concrete is going to perform for decades to come.

The form removal checklist presented below. Complete and submit it for project’s QC.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Form Removal Preparation Checklist** | | |
| GC Construction Ltd. | | Project: | |
| **Number** | **Checkpoints** | | rate |
| **1** | Prior to removal, there are no visible deformity (failure) in the forms | |  |
| **Comment** |
| **2** | The concrete dust was managed by water | |  |
| **Comment** |
| **3** | No form was removed with excessive force/impact | |  |
| **Comment** |
| **4** | Most of the whole piece plywood used in forms are reusable | |  |
| **Comment** |
| **5** | There are no major defects or cracks on the concrete surface | |  |
| **Comment** |  | |  |
| **6** | Curing materials (polyethylene, curing compound if utilized, fogging power washer if conditions require) are removed from site | |  |
| **Comment** |  | |  |
|  | [In the case of cold weather concrete procedures, there may be other decisions to be made that may be placed in this Curing preparation checklist, such as installation of thermal blankets to prevent concrete from freezing until such time as it has reached the minimum allowable strength. | |  |
|  |  | |  |

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| **Quality Scores and Completion Sign-off** |
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# Quality Assurance Approval

All the requirement of checklists for curing preparation and curing process must pass for the approval of curing process. The Form Removal checklist focuses more on clean concrete surface and the reusability of the plywood used in the forms. If the results do not match the requirements the PM will have additional expense for the breaking and reimplementation of the concrete work. Therefore, performing the process carefully and accordingly as instructed in this work method is necessary for preventing additional costs.

Any non-conformance shall be reported through the NCR procedure described in GC’s QP and is applicable to any and all phases of the concrete work (including form, pour, and cure)

# References

1. The Handouts and QMS sample documents provided by Mr. Jim Turnham (CMGT-7246)
2. The template of the WMs provided by Mr. Behrouz Chehrehpardaz (to keep work method formats consistent in the Master QP)
3. Mr. Tyler Ley videos, concrete professor in US ( <https://www.youtube.com/tyler_ley> )
4. BC Building Code
5. WorkSafeBC Regulations
6. DWV Bylaws

## CSA A23.1 Concrete materials and methods of concrete construction