TITLE: Excavations & Trenching		**STANDARD:**	212
ISSUE DATE:	31 October 2015	**ISSUE No:**	001

Definitions (in relation to this Standard)

Competent	Trained, experienced & qualified (Approved by Royal Commission)
Excavation	A cavity formed by cutting, digging or scooping in the earth by manual or mechanical means
Trench	A long, usually narrow and steep-sided excavation less than 15 feet wide

Cross-References

- Contract Special Condition 19 – Contractor ES&H Program
- Contract Special Condition 20 – ES&H Construction Phase Plan
- Contract Special Condition 54 – Continuous Dewatering during Construction
- Standard 208 – Construction Plant & Vehicle Management
- Standard 211 – Detection of Buried Services
- Standard 226 – Confined Spaces Management
- Standard 229 – Night work & Lighting

Standard

Planning Stage

1. Contractor must appoint a competent person to supervise excavations, trenching, and backfilling in accordance with Special Condition 19. Resume of the proposed person is to be submitted to Royal Commission for review and approval (refer to SC 9 – key personnel); this person by the very nature of works should be a competent civil engineer. This person must attend an interview for approval by Royal Commission ES&H.

2. Contractor is to commission and develop a geotechnical report (including hazardous or potentially contaminated material) to determine the characteristics and properties of the soil materials that will be encountered during excavations and provide geotechnical conclusions and recommendations for the design of control measures for the project.

3. The geotechnical report should provide valuable information for use in determining, but not limited to, the following:

    - Dewatering requirements
    - Slope stability
    - Soil classification
    - Ground support requirements
    - Shoring requirements
    - Ground hardness
    - Suitability of materials for excavation
    - Guidelines for equipment selection
    - Ground pressure guidelines by depth

- Estimated swelling adjusting factor
- Location of aquifers
- Soil contaminants
- Other related issues to support site earthwork activities

4. In some instances, it may be necessary to perform additional borings or subsurface investigations to identify subsurface utilities, obstructions and soil conditions; Standard 211 – Detection of Buried Services is to be followed.

5. Contractor shall identify areas for material lay-down of items such as culvert & drain material, trench-box and shoring equipments, gravel, sand and rock or any other material required for earthworks.

6. Contractor shall then submit the risk assessment, Safe Sequence of Work (method statement) and geotechnical report to the Royal Commission for approval in accordance with Contract Special Condition 20, and inclusion in the Construction Phase ES&H Plan.

7. Contractor shall be responsible for the prequalification and selection of material testing laboratories. The material testing laboratory shall be capable of meeting requirements for soil testing required by the engineering specifications.

8. Contractor shall use non-potable water and borrow-pit sources for earthworks activities supplied by Royal Commission.

9. No Excavation operations are to commence before approval of the geotechnical report, and the risk assessment and Safe Sequence of Work (method statement) by Royal Commission.

Dewatering Operations

10. If the excavation is expected to encounter water through groundwater, leaking pipes, storm water, or other sources, a dewatering system must be provided by the Contractor. The Construction Phase ES&H Plan shall include a dewatering plan detailing the pumps to be used, well-point system, availability of power, water discharge locations and discharge permits if applicable, including a drawing showing locations of pumps, generators and discharge locations. Dewatering operations should normally be started 24 hours before excavation work commences and be stopped when backfilling of excavation is completed. Contractor to include at method statement regarding servicing and maintenance of pumps during night time in accordance with Standard 229 – Night work & Lighting.

Permit to Dig

11. Prior to initiating excavation or trenching operations, the excavation competent person is to verify encroachment permits in place, work site conditions, including location and detection of all utilities and services, availability of equipment to be used as detailed in the risk assessment and Safe Sequence of Work, the construction plant equipment certification, and operator qualifications.

12. The excavation competent person is then to issue a Utility Clearance form (excavation permit to dig) (See Appendix 1), which shall be valid for up to a maximum period of 1 month, after which a new permit shall be required.

13. The excavation competent person shall ensure that the latest revision of as-laid (as-built) drawings have been used to locate all underground installations and buried services in the area to be excavated.

14. The excavation competent person shall note on the Utility Clearance form any special requirements and control measures required for the excavation (i.e. sloping, benching, shoring or trench ground support system).

Figure 1 – example of sloping and barricades


Figure 2 - example of benching


Figure 3 – sheet metal piles


Figure 4 – sheet metal piles and secant piles in the background


Figure 5 – trench ground support system (trench-box)


Figure 6 – secant piles & dewatering system

Inspection

15. A daily inspection of excavations and trenches shall be performed by the excavation competent person as per Appendix 2, before allowing any person to enter, and only when it is safe to do so. The inspection form shall be kept with the Utility Clearance form; both documents shall be made available to the Royal Commission upon request.

16. STARRT Card / JHA (Job Hazard Analysis) to be completed each work shift before allowing workers access to any excavation or trench. Written documentation to be kept.

17. The excavation competent person responsible shall conduct a daily inspection of all excavations and trenches for signs of a possible cave-in, failure of protective systems and equipment, leaking equipments polluting land or water, hazardous atmosphere or any other hazardous conditions. All defects shall be addressed before work is allowed to commence in the excavation / trench concerned.

18. Excavations and trenches must also be inspected by the excavation competent person after any event likely to have affected the strength or stability (i.e., rain, earthquake, new excavations nearby, etc.), and after any cave-in.

General

19. Standard 211 – Detection of Buried Services must be adhered to for all excavation and trenching operations.

20. Mechanical excavators and power tools must not be used within 0.5m of the indicated line of services. Only hand digging is permitted, and then with round nose shovels only

21. Slopes of all open excavations and trenches shall be cut at the angle of repose for the soil conditions (i.e. dry sand 38 degrees; wet sand 22 degrees).

22. All spoil material excavated must be kept a distance away from the edge equal to the depth of the excavation (i.e. for an excavation 4m deep, the spoil must be 4m away). In all cases spoil must be a minimum of 2m from edge. The same principle applies to any materials/equipment stacked next to excavation.

23. A means of access & egress shall be provided every 25 feet (7.6m) for all excavations and trenches.

24. All excavations and trenches shall be appropriately identified with signs, warnings and barricades. If adjacent to roads or general public access these must conform to all relevant traffic regulations and also be adequately lit at night. All excavations must have a rigid hard barricade at all times.

25. Soft barricades must be a minimum of 6 feet (1.8m) away from the open edges of the excavation or trench. Height of barricades must be the same as guardrails for a working platform. If soft barricades are not possible due to space restriction, provide rigid barricades at least 2 feet (0.6m) away from open edges of the excavation or trench that is capable of supporting 200 pounds (90.7 kg) of force. Hard connecter barriers must be used where moving equipment and vehicles are passing.

26. Excavations must be suitably supported if vehicles or moving machinery pass within 6 feet (1.8m), or if there is a risk of collapse of the excavation wall due to surcharge. Supports systems are to be designed by a registered civil engineer.

27. Whilst in an excavation or trench, no employees are permitted within 10m of construction plant working, vehicles unloading into, or a lifting operation overhead.

28. Where vehicles are used for tipping materials into an excavation or trench, well anchored stop-blocks must be used at a minimum distance of 1.8m from the edge to prevent the vehicle overrunning the edge.

29. Only trained flagmen/banks men (Redman) are permitted to go near any construction plant or vehicle, and only after making eye contact with the driver/operator and signaling the equipment to stop before approaching.

30. Contractor must consider erosion control measures when using dewatering operations.

31. If an unexpected item of archeological interest is encountered, work must be stopped and Royal Commission informed.

32. All workers involved in excavations / trenching shall be trained in hazard awareness and best practices relevant to the site specific works.

Excavations

33. Where excavations are deeper than 4 feet (1.2m), the Contractor must use a recognized protective system:
    - Shoring Systems (Sheet Piles / Secant Piles / Hydraulic Shoring etc…)
    - Sloping
    - Benching

34. Sloping or benching for deep excavations (20 feet / 6.08m or more) must be designed by a registered professional engineer.

35. All shoring systems must be installed as per manufacturer's instructions by competent persons under the direct supervision of the excavations competent person or a competent civil engineer.

36. At all deep excavations (20 feet / 6.08m or more) access must be restricted, and a means of monitoring access and egress at the entrance must be established. All deep excavations must have at least 2 means of access/egress no more than 25 feet apart (7.6m).

Trenches

37. Trenches 4 feet (1.2m) or more in depth must be timber-shored, have a trench ground support system (shields / dragboxes / plateliners / speedshore etc…) or walls cut back to the appropriate slope.

38. All trench ground support systems must be designed by a qualified structural engineer, and installed by competent persons and manufacturer's instructions followed.

39. Conventional timber-shore (shuttering) props may be supported by mechanical (jacks or acrows) or hydraulic.

40. Trenches 4 feet (1.2m) or more in depth could be classed as a confined space, and controls put into place in accordance with Standard 226 – Confined Spaces Management.

Backfill Operations

41. Prior to the start of backfilling, the excavation competent person shall confirm that all utilities have been inspected, tested as required and adequately protected.

42. The excavation shall be cleaned of all waste and slurries and all other unacceptable materials.

43. Contractor shall ensure the correct grade of backfill is used, and arrange for compaction testing as required.

Specialist Operations

44. Contractor must appoint a competent sub-contractor for all Tunnel Boring Machine (TBM) or Horizontal Directional Drilling (HDD) Operations. The proposed sub-contractor must be approved by the Royal Commission before start of the Works.

45. The Construction Phase ES&H Plan will contain the detailed, Risk Assessment and Safe Sequence of Work of the TBM or HDD Operations specific to the Contract and be approved by the Royal Commission.

Rev.	Date	Description	Prep.	Checked	Approved
000	May-2009	Original	MS	WG	HS
001	Oct - 2015	1st Revision	FH	FC	AK

Appendix 1

UTILITY CLEARANCE RECORD (Permit to Dig)

Contractor:

Contract No:

Location:

Date from: Date to:

Sequence	Notes	Date	By
Site Visit			
Drawings Review			
SEC contacted (if applicable)			
Marafiq contacted (if applicable)			
Industry contacted (if applicable)			
RC Department contacted (if applicable)			
Other Agency (Port Authority etc…)			
Utilities Detection Equipment used			
Utilities marked out			
All excavations marked out			
Trial holes dug for confirmation			
Pre-Task briefing given			
Contractor ES&H Manager/Officer approval			
Contractor Site Manager approval			
Any/All Encroachment permits			

A pre-task briefing has been given to me, and I fully understand the procedure for excavations when existing underground utilities have been identified.
I am aware of what to do in an emergency and who to call.

Site Supervisor Name:

Plant Operator Name:

Laborers: