MCX

This Executive Insight looks at location factors from a nontraditional perspective.
Location factors for six global scale projects are compared.
Strategies and tactics suitable for location-challenged large complex projects are outlined.

In construction, according to AACE[1] International[2], "A location factor is an instantaneous (i.e., current—has no escalation or currency exchange projection) overall total project factor for translating the total cost of the project cost elements of a defined construction project scope of work from one geographic location to another. This factor recognizes differences in productivity and costs for labor, engineered equipment, commodities, freight, duties, taxes, procurement, engineering, design, and project administration. The cost of land, scope/design differences for local conditions and codes, and differences in operating philosophies are n M nonlinear ways. Large complex projects located in more extreme environments create even more of a challenge, because there may not be any relevant similar projects.

This Executive Insight provides a comparison of a half dozen location-challenged projects and identifies relevant strategies and tactics across this group. The enumeration represents useful guidance for addressing location factors faced in challenging environments. These strategies and tactics themselves each represent thinking and practices which were developed over many prior projects of similar character and scale. Table 1 provides a general recap of these location-challenged projects.

Confidentiality concerns prevent the projects' direct identification. The strategies and solutions laid out are, by design, not linked to any particular project. Rather

The design of location-challenged projects changes from traditional projects in several fundamental ways. First, the design parameters and material specifications traditionally used must all be re-examined. Temperature extremes may require the specification of heating or cooling blankets on mass concrete pours. Poor quality local water supplies may require pre-treatment of water used in various construction operations with requirements beyond what would be normally be considered.

The anticipated difficulties in on-site construction must be recognized and additional considerations given to logical system interface points to manage the myriad of challenges along the logistical chain, including possible extremes of load limits and shipping envelopes.

Design must pay special attention to simplifying the supply chain and erection and ensuring that appropriate means and methods will work in the project environment.

Utilize a strong construction basis of design[7].
Maximize manual construction performed in protected locations (dynamic air shelter; protection from Artic wind; shade) through careful layout during FEL.
Artic plant valves should be located on the south side of plant.
High quality welding should be performed, to the extent possible, in a controlled environment.
Controls and instrumentation should be designed to be plug and play installation on prefabricated assemblies.
Be aware of a modified sequence of activities that modularization and development of strategic supplier relationships require.
Use readily produced, standard member sizes in program-wide steel design.
Specify standardized connection details, bolt sizes, and tools.
Develop a dedicated module yard.
Engineering activities should be focused on maximizing standardization[8] and modularization.
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Common layouts that allow conveyance systems (conveyors; select piping) to be standardized to a high degree.

Individual modules should include MCCs (motor control centers) for their systems.

Utilize a temporary modular wharf (or roll-on, roll-off dock facility) for construction materials if ports are constrained.

FEL process may be compressed in select incidences, recognizing overall project schedule impacts may be created by specific location factors. The quality of the FEL process must be maintained.

Deliver by utilizing modularization and achieve a higher degree of preassembly on non-module portions of the facility.

Protect design integrity through additional quality control, recognizing the significant project execution impact.

Modularized designs will utilize BIM (building information modeling).

Focus on optimizing project execution, noq0.00000912 0 6.000hess ifs wct incidences

Increase the focus on construction materials inventory management[11] (cost factor) and spare part and supply adequacy (time factor).

o SKU (Stock Keeping Unit) management has proven to be effective.

Augment shop inspection and testing to minimize field defects that then require remediation.

Extend the logistics role into major items of supply to maximize efficiency of the logistics chain.

Evaluate and reinforce principal logistics paths.

Use Antonov® [12] (or other large cargo aircraft) for schedule-sensitive, large/heavy equipment items.

Use a prefabricated wharf for construction materials.

Location-challenged projects impact all aspects of project execution. These type projects may require significant modifications to traditional means and methods or the development of completely new ones. In select instances, such new means and methods have resulted in the development and building of new construction equipment.

A key question that must be addressed at the outset of the project is: What μυστ be constructed on-site versus what χαν be prefabricated off-site in a more productive location? The answer is best found by beginning with the development of a χονστρυχτιον basis of design that, together with the more traditional basis of design, will then guide all design development activities. While the use of a construction basis of design is good practice on all large complex project, it takes on added importance in location-challenged projects due to the numerous challenges to be faced.

Precast underground duct banks
Precast electrical and telecom pull boxes
Maximize steel fabrication to complete assemblies (stair towers, access platforms)
Pipe support, electrical/instrumentation stanchions all prefabricated and assembled
Tanks that are shop built
Prefab electrical vaults, telecoms buildings, switchgear substations, and control rooms
Standardized electrical vault cable tray runs and preassemble (or include in modules as appropriate)
Underground pipes spooled to 80-foot lengths, coated and tested
Precast concrete sumps and pipe trenches

[11] Executive Insight, Inventories – A Key EPC Consideration for Achieving Capital Efficiency
[12] Ukrainian heavy lift aircraft manufacturer; largest heavy lift plane in the world.

Fuel storage bladders
Selective use of saline or brackish water in concrete for temporary construction

Digital twins created in BIM to facilitate construction simulation
Laser scans to record existing and as-built conditions and reconcile with digital twins

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Αλτηουγη τηε αυτηορ ανδ NAX ηαϖε μαδε εϖερψ εφφορτ το ενσυρε αχχυραχψ ανδ χομπλετενεσσ οφ τηε αδϖιχε ορ ινφορματιον πρεσεντεδ ωιτηιν, NAX ανδ τηε αυτηορ ασσυμε νο ρεσπονσιβιλιτψ φορ ανψ ερρορσ, ιναχχυραχιεσ, ομισσιονσ ορ ινχονσιστενχιεσ ιτ μαψ χονταιν, ορ φορ ανψ ρεσυλτσ οβταινεδ φρομ τηε υσε οφ τηισ ινφορματιον. ŒZ ]v(}Œu š]}v ]• ‰Œ}À] }v v ^•]•_ •]• Á]šZ v} Pµ Œ vš χομπλετενεσσ, αχχυραχψ, υσεφυλνεσσ ορ τιμελινεσσ, ανδ ωιτηουτ ανψ ωαρραντιεσ οφ ανψ κινδ ωηατσοεϖερ, εξπρεσσ ορ ιμπλιεδ. Ρελιανχε ον ανψ ινφορματιον προϖιδεδ βψ NAX ορ τηε αυτηορ ισ σολελψ ατ ψουρ οων ρισκ.