

Supplemental Attachment – ATS-N Part III ITM 7(a)

Item 7: Order Types and Attributes a. Identify and explain each order type offered by the NMS Stock ATS. In your explanation, include the following: i. priority, including the order type's priority upon order entry and any subsequent change to priority (if applicable); whether and when the order type can receive a new time stamp; the order type's priority vis-à-vis other orders on the book due to changes in the NBBO or other reference price; and any instance in which the order type could lose execution priority to a later arriving order at the same price; ii. conditions, including any price conditions (e.g., how price conditions affect the rank and price at which it can be executed; conditions on the display or non- display of an order; or conditions on executability and routability); iii. order types designed not to remove liquidity (e.g., post-only orders), including what occurs when such order is marketable against trading interest on the NMS Stock ATS when received; iv. order types that adjust their price as changes to the order book occur (e.g., price sliding orders or pegged orders) or have a discretionary range, including an order's rank and price upon order entry and whether such prices or rank may change based on the NBBO or other market conditions when using such order type; when the order type is executable and at what price the execution would occur; whether the price at which the order type can be executed ever changes; and if the order type can operate in different ways, the default operation of the order type; v. whether an order type is eligible for routing to other Trading Centers; vi. the time-in-force instructions that can be used or not used with each order type; vii. the circumstances under which order types may be combined with another order type, modified, replaced, canceled, rejected, or removed from the NMS Stock ATS; and viii. the availability of order types across all forms of connectivity to the NMS Stock ATS and differences, if any, in the availability of an order type across those forms of connectivity.

VWAP Orders

The ATS accepts VWAP Orders in the IVWP book, and in Hosted Pools at the request of the Subscriber that requested that the Hosted Pool be set up. VWAP Orders have an execution price equal to a calculated volume-weighted average price ("VWAP") over a fixed time interval or floating (variable) time interval at the option of the Subscriber. VWAP Orders also offer an "Impute Match" feature, where an order with a fixed time interval can match against orders with a floating time interval.

Any Subscriber may submit VWAP Orders to the IVWP book. VWAP Orders in Hosted Pools are available to any Subscriber participating in a Hosted Pool that offers VWAP Orders.

VWAP Orders follow a similar workflow with regards to the invitation and firm up process as Conditional Orders (as discussed in Part III, Item 9) with certain exceptions. The primary differences include: (i) VWAP Order invitations are only on a one-to-one basis; (ii) VWAP Orders have a particular time frame in which to firm up; (iii) VWAP Order invitations include matched quantity; (iv) VWAP Order invitations include the fixed time or participation rate at which the order matched against a contra; (v) for Impute Match invitations will include either the matched participation rate or matched

time depending on the equivalence determination; and (vi) short sale VWAP Orders are not accepted in short sale restricted securities.

Subscribers must send VWAP Orders with a quantity, as a limit order or market order, and either: (i) a minimum and maximum time for fixed time interval; (ii) a minimum and maximum participation rate for floating time interval; or (iii) for Impute Match, either (a) an instruction to Impute Match, and either a minimum and maximum time, or a minimum and maximum participation rate ("ATS Imputation", as defined below), or (b) parameters for both time and participation rate ("Subscriber Imputation", as defined below).

For fixed time intervals, the minimum order time is twenty (20) seconds ("System Minimum VWAP Time"), and each order's minimum match time must not exceed the maximum match time (which cannot exceed the end of the regular session) of the opposing order.

For floating time intervals, there is no minimum order time, and the minimum participation rate must not exceed the maximum participation rate of the opposing order.

By default, VWAP Orders will utilize broker preferencing, where among competing matches, a Subscriber's order will first match against that Subscriber's own orders by MPID. The ATS determines matches among eligible contras for VWAP orders as follows: (1) for fixed time orders, all orders priced greater than or equal to the far touch (satisfying marketability constraints) will be ranked equally by price, and matched using MPID (*i.e.*, broker preferencing), size, and time priority in that order; and (2) for floating time orders, all orders priced greater than or equal to the far touch (satisfying marketability constraints) will be ranked equally by price, and matched using MPID, size, participation rate, and time priority in that order. VWAP Orders only match with other VWAP Orders.

Impute Match uses estimated equivalences between fixed and floating time intervals to determine matches amongst eligible orders. For fixed time intervals, a specified match quantity over fixed time has an implied participation rate relative to market volume in the security for that interval. Similarly, a participation rate and match quantity has an implied time duration for that interval. Because market volume in the security is unknown at the time the match begins, both the implied participation rate for a fixed time match, and the implied time duration for a floating time match determined by participation rate, are estimated with equivalences. For the purposes of identifying potential matches using Impute Match, VWAP Orders can use either (i) an ATS-calculated Volume-Time Prediction ("ATS Imputed"), which is an ATS-calculated equivalence between fixed time and participation rate for each specific security, or (ii) Subscriber-determined equivalences ("Subscriber Imputed"). Both ATS and Subscriber Imputation are indicated on an order-by-order basis.

If Impute Match is enabled by the Subscriber for an order, the matching engine will attempt to find contras for the order within the minimum and maximum time, or the minimum and maximum participation rate, using either ATS or Subscriber equivalences, with Subscriber equivalences always taking precedence over ATS equivalences. Eligible

matches among fixed time and floating time contras are determined according to the priority rules for fixed time and floating time respectively, and the ATS will always match an Impute Match on a fixed time interval if there is an available fixed time interval match.

An order that is not instructed to Impute Match may match against an order that is eligible to Impute Match, if the contra order (fixed or floating time interval) matches the contra order attributes of the non-imputed order.

Once a match is identified, invites are sent automatically by the ATS based on the priority stated above on a one-to-one basis, i.e., only a single invite will be sent, which can generate a single firm up. Match quantity is the smaller of the two quantities of the two orders matched and match time or participation rate is the smaller of the two specified maximum order times or participation rates. Invitations include the match quantity and the applicable fixed time or participation rate for the match.

Both sides have up to 2,000 milliseconds to firm up by submitting a firm up order in response to the invite. The firm up order can be a limit or a market order. Market firm up orders have a single global price collar which acts as a risk control, applied at a set percentage through the far touch NBBO at firm up time. If one party does not firm up, the match is cancelled, and the party that has firmed up will receive a cancellation. If one party responds at or after 2,000 milliseconds, they will receive a rejection, and the VWAP Order and counterparty order is similarly cancelled. Only when both sides firm up, the match can occur, and both parties will receive a restatement message to indicate the start of the match.

Once the restatement has been sent by the ATS, the execution price calculation can begin. The VWAP is calculated by collecting all executed trades reported via the SIP (with the exception of particular condition codes, such as derivatively priced prints or auctions, among others) during a period of time, known as the "VWAP Calculation Interval". Pursuant to Rule 611 of Regulation NMS, for VWAP Orders, executions may occur outside of the prevailing NBBO.

For fixed time intervals, the VWAP Calculation Interval is set explicitly according to the smaller of the Subscriber specified maximum order times as described above, and both parties will receive a single VWAP execution at the end of the VWAP Calculation Interval with a corresponding single price in an execution report.

For floating time intervals, participation rate is a designated percentage of market volume and the total time of a floating time match is equal to the participation rate multiplied by market volume in the security following the start of a match (calculated from SIP trades using the same methodology as the execution price determination described above), and market volume in the security (and thus total match time) is unknown at the initiation of the match.

For floating time intervals, the match may thus receive one (1) or more prints to fill the matched quantity, with each print sent at a randomly determined print interval between 40

and 60 seconds, including the final print, representing a VWAP Calculation Interval. VWAP Calculation Intervals for floating time matches will start after the restatement, or in the case of multiple prints, the prior print time. Floating time interval orders will not print earlier than the randomly determined print interval; randomly determined print intervals will continue until the match quantity is complete unless cancelled; and orders cancelled before the first randomly determined match interval will receive no execution.

For VWAP Orders matched using the Impute Match feature, the prints will occur according to either the fixed time (end of the VWAP Calculation Interval) or at the randomized intervals, depending on whether the Imputed Match resolved to a fixed time or floating time.

A VWAP Order can be cancelled at any time. For orders on a fixed or floating time interval, if either firm up order is cancelled before the System Minimum VWAP Time for that VWAP Order, then no VWAP print will be returned and there will be no partial fill, and the remaining firm up order will be cancelled. If the firm up order is cancelled during the VWAP Calculation Interval, and after the System Minimum VWAP Time, then for fixed time interval matches the quantity filled will be proportional to the elapsed VWAP time, and for floating time interval matches, the quantity filled will be proportional to the participation rate and market volume in the security to the time of the cancel. In both cases, the VWAP price will be the VWAP for the elapsed interval.

Any VWAP Calculation Intervals open at the end of the trading day will be terminated at the end of the regular session. For orders with a fixed time interval, a new match will not be initiated if the match will end at or beyond the end of the regular session (*i.e.*, the fixed time interval match must complete before the end of the regular session). For orders with a floating time interval, a new match will not be initiated after one (1) minute prior to the end of the regular trading session, allowing one final randomly determined interval (between 40 and 60 seconds) before the end of the regular session. For orders matching a minute or more before the end of the regular session, where a floating time interval might match after the end of the regular session, there will only be one final print in the last minute before the end of the regular session, before canceling the balance back to the Subscriber.

The minimum quantity of one (1) share must also be met to allow for a partial fill. In the event a security becomes subject to a trading halt or short sale restriction during the VWAP Calculation Interval, for both fixed time and floating time, the firm up orders will be cancelled and no executions will occur. Once a VWAP calculation has started, the only option is to cancel the VWAP Order, and no modifications can be made.

If the calculated VWAP price breaches the specified limit price for a fixed time VWAP Order, and this occurs prior to the System Minimum VWAP Time for that VWAP Order, then there will be no partial fills. If the breach occurs after the System Minimum VWAP Time for a fixed time VWAP Order, then the quantity filled will be proportional to the elapsed time, and the price will be the VWAP for the elapsed interval. The trade that caused the VWAP price to breach will be excluded from the VWAP calculation. If the calculated VWAP price breaches the specified limit price for a floating time VWAP

Order, and this occurs prior to the next randomly determined VWAP interval, then the VWAP Order will be cancelled with no partial fills.

If there are fewer than two (2) trades during the VWAP Calculation Interval, then the midpoint of NBBO at the end of the interval will be used for the VWAP price for both floating time and fixed time matches; however, for floating time matches, if there are no trades in the VWAP Calculation Interval, there will be no execution.

If a trade correction/cancellation occurs for a trade that is part of the VWAP calculation, then the VWAP price for the VWAP Calculation Interval affected by the trade will need to be manually adjusted to reflect this event. If the adjustment would cause the VWAP price to violate a limit price constraint for either of the counterparties, then the VWAP print will be manually cancelled. These adjustments, if needed, will occur after the VWAP Order has already been reported to counterparties and printed to the tape.

IVWP Book

VWAP Orders submitted to IVWP support the full capabilities of VWAP Orders as described above, including fixed and floating time intervals, Impute Match, the invitation and firm-up process, VWAP Calculation Interval, cancellation behavior, and all related procedures.

The following features are available for VWAP Orders in the IVWP book:

- (1) Counterparty Selection: Subscribers may allow or prevent matching against a specific contra(s) in the IVWP book on a per order basis, as described further below in Part III, Item 14.
- (2) Minimum Quantity: Subscribers may specify a minimum execution quantity for VWAP Orders.
- (3) Maximum Quantity: Subscribers may specify a maximum execution quantity (MaxQty) for VWAP Orders.
- (4) Self-Match Prevention: Subscribers can configure their VWAP Orders to prevent self-crossing.
- (5) Agency/Principal/Riskless Principal Capacity: Subscribers may elect to block matching against riskless principal or principal orders.
- (6) Linked Orders: Subscribers may submit orders designated to cross against each other using a Link ID, as described in Part III, Item 14.

VWAP Orders submitted to the IVWP book cannot be designated to also interact with Hosted Pools, Midpoint or ASPEN.